ORDINATIO ET DISPOSITIO

Design and Meaning in Pompeian Private Architecture

PART I: Presentation and Discussion

Proefschrift
ter verkrijging van
de graad van Doctor aan de Universiteit Leiden,
op gezag van Rector Magnificus prof. mr. P.F. van der Heijden,
volgens het besluit van het College voor Promoties
te verdedigen op woensdag 4 februari 2009
klokke 16:15 uur
door
Leonore Maria van Krimpen-Winckel
geboren te Berkel en Rodenrijs
in 1975

Promotiecommissie:

Promotores:	Prof. dr. H.A.A.P. Geertman
	Prof. dr. W.J.H. Willems
Referent:	Prof. dr. A. Wallace-Hadrill
Overige leden:	Prof. dr. J.L. Bintliff
	Prof. dr. J.P. Hogendijk
	Prof. dr. L. de Ligt
	Dr. P.G.P. Meyboom
	Prof. dr. E.M. Moormann

CONTENTS

INTRODUCTION

The start of something new

What were the professional traditions and customs behind the design and construction of the houses of the elite in the Campanian town Pompeii? And what were the thoughts and experiences of the generations of people living in them? As part of a longstanding architectural tradition the atrium house – or, perhaps more accurately, this particular variant of the courtyard house – was one of the most persistent and adjustable house forms in the history of the Italian peninsula. Contrary to popular conception, the atrium house cannot be seen as the 'typical' Roman house. The abundance of early examples, including the Samnite atrium houses of Pompeii, are testimony to their indigenous Italic character, which was later pushed to the background when early scholars branded the atrium house as a symbol and representation of Roman culture.

However much we may think we already know about the Pompeian elite houses, a general shift in focus of studies concerned with private architecture has made painfully clear that our knowledge is still greatly impaired. As part of a much wider, international change in approach in Classical Archaeology, we have moved away from the traditional categorical approach to a contextual approach. Whereas previously, research of the house was disconnected by subdividing it into a number of categories of scholarly interest, such as 'architecture', 'decoration', 'furniture' or 'artefacts', studies of the last few decades are focussed on the house as a living unit, drawing together all aspects that together made it a home. The combined information of these aspects has the power to create a picture of the everyday use of these houses, through reading the underlying social structures and patterns. This 'social information' is not restricted to the houses per se, but is also a reflection of society at large.

The current research taps into the contextual framework that is now coming into existence, adding new information to the current questions and themes from a specific viewpoint. My study of the design of Pompeian atrium-peristyle houses commenced in the summer of 1997, during my first field trip to the site as a student in the Pompeii project of the University of Leiden, directed by Herman Geertman. This project, now known as *RUSPA* (*Ricerche Urbanistiche Su Pompei Antica*) ran from the University of Leiden between 1989-1997 and from the Istituto Olandese in Rome between 1998-2002[1].

From the project's existing database of files on houses, eight atrium-peristyle complexes were selected for analysis in my MA-thesis[2]. The starting point for this study was formed by

---

[1] The field data used in the metrological analyses of this study, including detailed measurements by GIS as well as by tape measurements and descriptions of the building techniques and materials used in the construction of each individual house, have been collected in the context of *RUSPA*. The members of this project were H. Geertman, H. Knikman, C. Saliou, A. Schoonhoven, N. Rabouw and N. Van Krimpen-Winckel.

[2] The selection criteria for the houses and peristyle-gardens analysed in this research are discussed in detailed in Chapter I.

two earlier publications, one on the used foot measures and the other on the principles of design in five Pompeian atrium houses, by Cees Peterse and Herman Geertman respectively[3]. Increasing the total number of studied houses and including the analysis of the peristyle-garden to the research, provided a larger database for conclusions on the methods of design that were used by local Pompeian architects. However, it also led to a considerable number of new questions, in particular where the use of these houses was concerned and the role that the design played in their social meaning. Mostly, the MA-thesis confirmed that the chosen method of research formed a solid and fruitful starting point for a much broader research of grand houses constructed by an architect, in the social context of Pompeii.

In the subsequent PhD-research, the field of study was broadened in two respects. Firstly, the number of atrium-peristyle houses was increased to a total of eighteen, resulting in a more reliable comparative database for the reconstruction of the methods of design that were applied in the building practice of private architecture of Samnite Pompeii. Secondly, the combined results of the individual metrological analyses are used to offer new information on the social meaning of these grand houses and their relationship with society. This research, including both the technical-mathematical analysis of design and the interpretation of the social meaning of elite houses of a past society, is placed within a wider framework that draws together a considerable number of approaches in the field of private architecture.

The broader framework: the study of design

The reconstruction and interpretation of design through metrological analysis can only be valid and justified when related to a wider methodological framework of studies that create a historical background for the traditions and practices of Pompeian private architecture.

Chapter II is a discussion of the most important ancient written source on Roman architecture, Vitruvius' *De architectura*. The interpretation of this source by a number of different scholars provides us with an understanding of the ancient architect's theory and practice, his education, the traditions of his trade, and his confirmation to the rules and expectations of the society, in which he worked. It also informs us on the actual process of design, giving an insight into the different levels of decision-making and adjustments that took place in the development of a design, from the drawing table to the actual built structure.

The study of ancient mathematics in Chapter III is also crucial for our understanding of the working methods of the ancient architect, in this case the pre-Roman Pompeian architect. Adequate knowledge and understanding of the mathematical tradition in which the architect worked and the mathematical principles and means that were common

---

[3] Peterse 1984; Geertman 1984a. The houses concerned are: Casa di Sallustius (VI 2, 4); Casa dei Vettii (VI 15, 1); Casa delle Nozze d'Argento (V 2, i); Casa di M. Obellius Firmus (IX 14, 4); Casa dei Cei (I 6, 15).

(professional) knowledge at the time, gives meaning to our interpretation of the mathematical design. Assuming that these principles and means were part of the architect's repertoire, we can create a general framework that provides a backdrop for the metrological analysis of private architecture.

The broader framework: the study of social meaning

From the study of the design, we shift our attention to the meaning of the particular type of private architecture under investigation here, the atrium house and peristyle-garden complex. Understanding the meaning of a house inevitably means understanding its relationship with contemporary society, and the correlation between the one and the other. The Pompeian atrium-peristyle complexes were the result of a long history of architectural development and innovation. The 'atrium house' phenomenon was part of a long historical development of a typical Italic house form. Chapter IV is concerned with this development, regarding the evidence of early courtyard houses from Rome and a number of Roman and Etruscan colonies as well as evidence from Etruscan tombs, leading to a critical discussion of the Pompeian atrium houses in their particular context. Furthermore, a second and equally important architectural development will be traced, the introduction of the peristyle-garden as a foreign element from Hellenistic architecture. The addition of the peristyle as a second living-unit into these city residences had considerable consequences for the role and form of the atrium house. The relationship between the atrium and peristyle will be analysed here by studying the current opinions of modern scholars, and again in Chapter V, where the same topic will be discussed through the results of the metrological analyses of this research.

The historical development of the atrium house and the addition of the peristyle-garden, brings us to the atrium-peristyle house in the context of Pompeian society. The study of Pompeian atrium-peristyle houses with the aim of gaining new insights into society at large, and the relationship between house and society in particular, is a popular and fruitful research topic. Pompeii provides an excellent playground for this type of social study, because in any city with a differentiated community, houses are a way of expressing social position and wealth[4].

Chapter V forms a synthesis between what we know of the social history and context of these houses from a range of studies on this topic, and new information through the metrological analysis applied in this research. In Pompeii, the study of ancient social life from the perspective of the house has received much attention in the last decades, leading to a large number of publications, in which certain themes frequently recur. These themes include the functions of the different rooms within the house, and the hierarchy that existed between them. Also, the separation between 'public' and 'private' space within the house is a much discussed topic. On a larger scale, the position of the house within the differentiated street network of the city also plays a role in its social meaning. This variation of recurring themes

[4] Wallace-Hadrill 1994, xv.

is matched by a an according variety of research methods, including social-historical research, analysis of decoration patterns, analytical research methods such as *space syntax*, or the interpretation of artefact assemblages. Apart from the above mentioned research methods, which all have their roots in archaeology, art history or social history, we will also explore the angle of anthropological research, through a study by Gianetta Murru Corriga into the traditional building practices of houses on the island of Sardinia[5]. Her observations will prove to offer valuable information on several processes and social structures regarding private architecture that are extremely difficult or impossible to reconstruct by archaeological research or other studies of the past alone.

Following the description and discussion of the ongoing research in the field of private architecture, the results of the metrological analysis of the eighteen atrium-peristyle houses in the sample of this PhD thesis are presented and related to the most fruitful questions and themes in this field of study. This leads to new information on a design-technical level concerning the methods of design used by the architect, both in a mathematical-theoretical respect and on the practical level of trade. It also provides new insights on a social-historical level, regarding aspects such as the choices that were made during the initial design process, the traditional value of the atrium house, the appropriation of new architectural elements or the influence of a particular location in the city on a house design. This research will demonstrate that regarding the house through its design adds a valuable contribution to the information already gathered from other viewpoints.

[5] Murru Corriga 1994.

CHAPTER I

HISTORY AND METHODS OF RESEARCH

Introduction

More than half a century ago, Maiuri proposed the following methodological limits for the study of Italic and Roman houses[6]:

a. Studying the layout and structures is the basic foundation of the study of habitations.
b. Within the layout and structures, one has to distinguish the original parts from the added or modified parts.
c. The character of the structures is determined by the building materials and technique.
d. The decoration of walls and pavements forms an integral part of the study of houses and an import factor in dating.
e. The house follows and reflects not only the lives of the inhabitants, but also political, economic, artistic and urban aspects of the age in which it was constructed, restored or reconstructed. Even when the house reflects the ultimate phase of Pompeii, the alterations and modifications never destroy all of the traces of the older habitation – the researcher can recognise them if his eyes are trained to analyse the structures.
f. When regarding the houses of Pompeii in particular, one has to keep in mind the political and geophysical events, on which the city is built.

In this current study, Maiuri's second point of attention, concerning the recognition of the original parts and the added or modified parts of structure, is of particular importance. The eighteen Pompeian atrium houses that form the database of the analysis were all in use for an extensive period of time of at least one and a half or two centuries. During that time, each of those houses has inevitably undergone some changes, which may include the destruction or addition of certain parts of the house, as well as the rebuilding, repair and restoration of its structures, both in ancient and in modern times. To make a reliable reconstruction of the original layout and design of these houses, this study combines two lines of research that each extract different information from the structures and complement each other. These methods of research are the reconstruction of the building history and the subsequent reconstruction of that building's design, whereby the results of the analysis of the wall structures are a premise for the execution of the metrological analysis.

The Pompeian building history: a traditional reconstruction

The analysis of the building materials and techniques used in the construction of the houses allows us to make a reconstruction of their building history. The use of different

---

[6] Maiuri 1952, 6-7.

building materials and techniques has been of scholarly interest since the second half of the nineteenth century. Observations in contrasts in construction materials and techniques, combined with the wall and floor decorations that were used in the Pompeian public and private structures, resulted in a chrono-typology of the atrium houses. This traditional method of categorizing the atrium houses, first developed in the 1870s by Giuseppe Fiorelli[7], has recently become the object of much criticism, as will be discussed further below. The following construction periods have traditionally been recognized[8]:

1. FIRST SAMNITE AGE: THE LIMESTONE PERIOD (425–200 BC)

This period, which runs from the Samnite conquest until the Second Punic War, is often called the Limestone Period by archaeologists as this material, formed by the sediments of the river Sarno, was much used as a building material[9]. Large square blocks were placed on top of each other, often without the use of mortar, a technique called *opus quadratum* (Fig. 1).

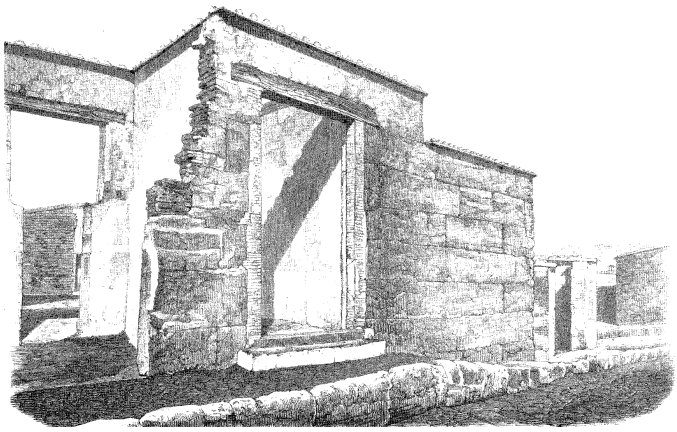


Figure 1: *Opus quadratum* in Sarno limestone, Casa del Chirurgo (after Overbeck)

The oldest examples of this technique can be found in the city wall and the so-called Doric temple on the Foro Triangolare. It was also used in private houses to build the façade, as can be seen in the Casa del Chirurgo. The internal walls of this house and many other houses were constructed in another technique called *opus africanum* (Fig. 2). In this technique, large blocks of limestone were placed vertically and horizontally to form a solid framing, while the remaining spaces were filled in with small blocks of limestone, lava or cruma. Hardly any binding agent was required for this technique except some clay. Cruma is the foam that builds on a stream of lava, turned solid. It has a

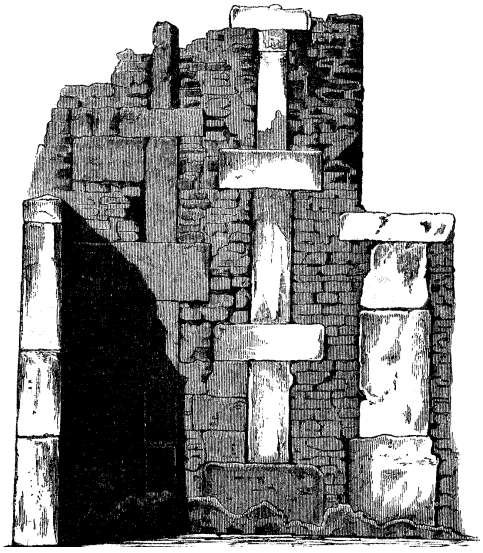


Figure 2: *Opus africanum* (after Overbeck)

[7] Fiorelli 1873.
[8] For a recent overview of the construction materials and techniques used in Pompeii, see Adam 2007, 98-113.
[9] Nissen 1877, 11-12

great porosity, is quite brittle, hard and light in weight. The type used in Pompeii is mostly of a dark red-brown colour. The lava that was used in this early period was of a porous quality and had a reddish colour, which are characteristics of lava derived from the superior layer of the volcanic deposit. In buildings dated to the second and first centuries BC, black and more durable lava from inferior layers was used, a material of a very hard quality and difficult to work. Apart from being used for building walls in small blocks, lava was also commonly applied to make thresholds and pave the streets.

2. SECOND SAMNITE AGE: THE TUFF PERIOD (200-80 BC)

In this period, which runs from the Second Punic War until the foundation of Sulla's colony, the Hellenistic cultural elements that were prominent in other cities in southern Italy such as Pozzuoli, Cuma and Naples, also became influential in Pompeii. The decorative architecture of this period shows strong Hellenistic influences. The building material that was most suited for making the elaborate decorations of Ionic, Doric and figurative capitals and gave the archaeological name to this period was grey tuff from Nocera, which was of a high quality and could easily be worked. This same tuff was also used for the *opus quadratum* technique in building facades, as well as for the impluvium and the openings of the cisterns next to the impluvium. The walls within the houses were built in a new technique called *opus incertum* (Fig. 3), a technique that started when the use of mortar became common practice. This mortar, which came from Pozzuoli and was therefore called 'pozzolana', made building with much smaller blocks of stone (*caementa*) possible, a more economic method than using large blocks. The centre of the wall was built up of fragments of stone and mortar of an inferior quality, whereas the outer shells were built up in more regular blocks of stone and mortar of a superior quality.

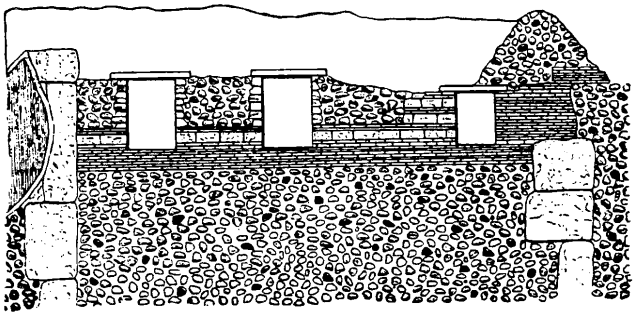


Figure 3: *opus incertum*

3. THE REPUBLICAN AGE (80-27 BC)

This period runs from the time when Pompeii became a Roman colony until the beginning of the Augustan Age. Within domestic architecture we can see building activities to restore damage of the Civil War, which was ended in 80 BC. At the same time, new additions were made to the already existing elements, such as baths, gardens and oeci, to fulfil the need for luxury. On the other hand, to fulfil a practical need of exploiting living space that had become more expensive with growing wealth and demographic expansion, upper storeys were added. Building techniques became more regular with the introduction of a unity of form in the blocks of lava, which were no longer placed at random in the *opus*

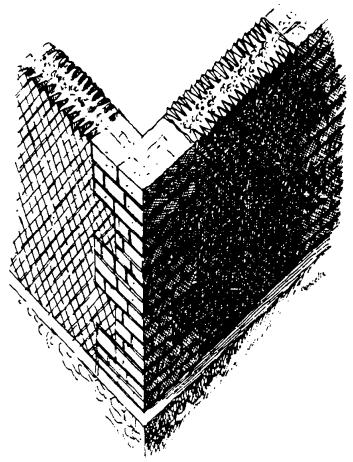


Figure 4: *opus reticulatum*

incertum technique, but in fairly straight diagonal lines, a technique called *opus quasi reticulatum*. This technique was refined even further in the second half of the first century BC to *opus reticulatum* (Fig. 4), in which small blocks of stone, which are pyramidal in shape, were placed in a neat diagonal network. The materials used for this technique were tuff or limestone. When *opus reticulatum* was mixed alternately with horizontal rows of tiles, this construction method is called *opus mixtum* or *compositum*. Tiles used in wall construction were a novelty of this age, as they were originally only used in roofs, with stamps dating back to Oscan times[10].

4. FIRST IMPERIAL AGE: FROM AUGUSTUS UNTIL CLAUDIUS (27 BC – AD 54)

With the Augustan peace facilitating interregional and maritime trade, a prosperous period started for Pompeii. An aqueduct was built to supply Pompeii with constant running water. From the highest point in town, where the castellum was built, it was distributed throughout the city via a system of lead water pipes. Many houses were connected to the system and had running water; a large portion of the population profited directly from the new convenience[11]. As a result of this innovation, many impluvia were no longer used for the storage of water. Construction methods show the perfecting of the *opus reticulatum* used to build the most important buildings of the city. A new technique that was developed in this period is that of *opus vittatum mixtum* (Fig. 5), in which horizontal rows of regular blocks of limestone or tuff are alternated with horizontal rows of brick in a relation of one to one or in other relations. This technique was mostly used to construct corners and doorposts, within a wall that was otherwise built up of *opus incertum* or *reticulatum*. The use of *latericium* (brick) in Pompeii became common in wall construction in the Sullan age and diffused even more during the Augustan era. Buildings that have been constructed completely in brick do not exist in Pompeii. Rather, walls were usually built up in *opus incertum* and only the corners, borders and freestanding columns were constructed in *latericium*[12].

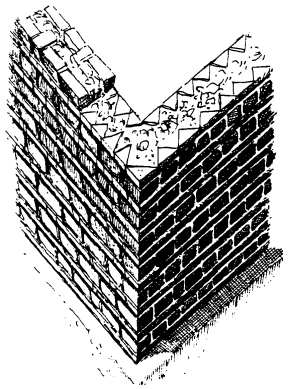


Figure 5: *opus vittatum mixtum*

[10] Nissen 1877, 22.
[11] Zanker 1998, 118.
[12] Nissen 1877, 27.

5. THE ULTIMATE PERIOD: FROM NERO UNTIL THE ERUPTION (AD 54-79)

In this age, houses were enlarged by the addition of storeys, built in a technique called *opus craticium* (Fig. 6), which had already been introduced in the first century BC and consisted of building a wooden framework and filling the gaps in between with small stones and mortar. This specific construction method was used to build upper storeys because of its lightweight, as the *opus incertum* walls of the houses were not strong enough to carry a heavy load. Only a few examples of this technique were saved in Pompeii, as most of the wood has perished.

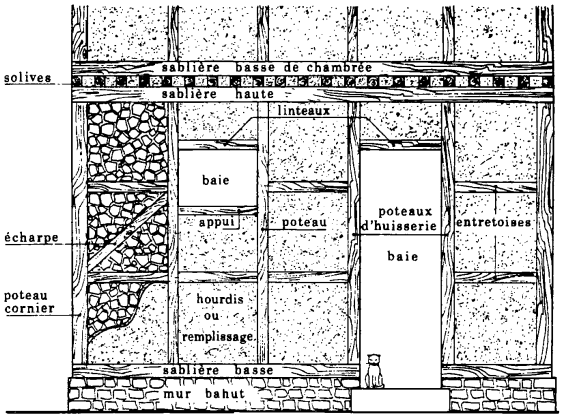


Figure 6: *opus craticium*

Recent developments: a critical revision of the chrono-typology

Recent stratigraphical research in several areas in Pompeii has revealed that the traditional and rigid division of construction techniques into chronological phases is problematic and in some cases even false. Regarding the 'typical' limestone period atrium houses of Pompeii, the category that includes the houses in the sample of this research, the popular view on their dating has shifted through the years. A good example is the Casa del Chirurgo, with its solid *opus quadratum* façade and atrium walls. This house has traditionally been presented as the oldest example of the limestone period in Pompeii, originally dated to the fifth century by Fiorelli and later re-dated by Maiuri to the end of the fourth or the third century BC[13]. For a long period, this date was not questioned, but it has now been proven incorrect. Chiaramonte-Treré, referring to the fact that in eight excavation pits Maiuri was not able to find any trace of the floor level of this presumed house of the fourth-third centuries BC, proposed that the chronology of the Casa del Chirurgo should be fixed between the second half of the third and the beginning of the second century BC[14]. More recently, excavations by the Anglo-American project in insula VI 1 have confirmed the presence of earlier occupation in this area. The levelling of these early structures and the original plot division of insula VI 1 can be dated to the end of the third or early second century BC This information, combined with the find of a coin dating to 214/212 BC in the layer of rubble underneath the atrium, suggests that the construction of the Casa del Chirurgo can be dated no earlier than 200 BC[15].

Results from excavations in other atrium houses from various locations in the city correspond to the second century BC date of the Casa del Chirurgo. For example the Casa di

[13] Maiuri 1973, 1-15.
[14] Chiaramonte-Treré 1993, 545-546.
[15] Jones & Robinson 2007, 389-392.

Giuseppe II (VIII 2, 38-39) and the Casa della Nozze d'Ercole (VII 9, 47), excavated by Paolo Carafa[16]. Excavations in the Casa delle Forme di Creta (VII 4, 62) revealed an earlier structure dating to the end of the fourth, beginning of the third century BC, and dated the original ground plan of the domus to the first half of the second century BC, with the construction of the atrium and the spaces alongside, ala and cubicula on the west[17]. The combined results of these (ongoing) stratigraphical studies reveal the presence of an earlier level of occupation underneath the standing structures of AD 79, and indicate that the Pompeian atrium houses cannot be dated before 200 BC[18]. Not everyone accepts this adjusted date, as Peterse still dates the limestone-framework era to the period from the middle of the fifth to the end of the first quarter of the second century BC[19].

Studying the building history of the Pompeian houses, we need to be aware that the use of different materials and techniques need not necessarily be the result of a different construction date. Availability, practicality or traditional use are all factors that may have played a role in the choice of materials and techniques when a house was constructed. It was Nissen who originally pointed out that different materials could serve different purposes, and some materials were easier to cut (Nocera tuff) and thus more suitable to create elaborate capitals or impluvium basins[20]. Even though a particular building technique such as limestone *opus quadratum* may have been particularly popular in earlier building periods, this by no means excludes its use in later times. It will take much more extensive excavation of the levels of Pompeii before AD 79 to come to a reliable framework that will allow us to appoint absolute dates to the construction of individual houses. Until that time, I will conform to the opinion that is most favoured by scholars working in Pompeii at the moment, and date the construction of the houses, which form the subject of my research, no earlier than the second century BC.

Although dating the use of certain materials and techniques to specific periods in time is highly problematic, a detailed analysis of the wall structures within one building can result in a reliable reconstruction of the relative construction chronology. However, here too, certain elements in the wall structures may lead to false conclusions. In some cases, the original building material is hard to recognise because of antique as well as modern repairs to the walls. Also, a house may have been completely or partially rebuilt during a later period in time, but along the same lines as the original design[21]. Furthermore, the use of a different building technique or materials does not necessarily imply a chronological difference for the construction of different parts of the house. For instance, walls that did not carry a first

---

[16] Carafa 1997, 17-22.
[17] D'Ambrosio & De Caro 1989, 173-215.
[18] See Carafa 2007 and Wallace-Hadrill 2007.
[19] Peterse 2007, 373-388.
[20] Nissen 1877, 13-14.
[21] See Nissen 1877, 31.

floor could be built with much lighter building materials than those carrying the extra weight of a first floor[22].

The metrological analysis

The reconstruction of the building history leads to a recognition of the original structural elements, a premise for the execution of the metrological analysis, which is a method of research whereby the analysis of the principal measures of a building leads to an understanding of the underlying system of design of that building. The measures used for this analysis are taken by archaeologists in the field, by means of GIS and detailed tape measurements. Inevitably, there will be some discrepancies between these modern measurements, and the measures as intended by the architect at the time of construction[23]. They can be caused by several factors, such as by misreading the measurement tape in the field, but more frequently by inaccuracies caused by the builders at the time when the house was constructed on site. There is also the matter of choosing certain points within the structure when taking measurements: which lines were considered to be crucial by the architect for the design of the house? Did the architect work with lines along the axes of the walls or was the width of the walls included in the measurements?[24] These possible differences between our perception of the house and the original planning by the architect could lead to the wrong conclusions regarding the measurements as originally planned. This methodological problem can be overcome by avoiding a focus on single – apparently meaningful - measures within a structure, but to consider the relation between the total of principal measurements within the house. The principal measurements of the atrium house are: the total width and depth of the plot; the width and depth of the fauces, atrium and tablinum; the depth of the spaces alongside the atrium; the tripartite division of the atrium by the position of the impluvium. The principal measurements of the peristyle-garden are: the total width and depth of the garden; the width and depth of the peristyle; the depth of the porticoes surrounding the peristyle; the width and depth of the spaces surrounding the peristyle-garden and connected to it. Once the system behind those measurements is recognised, it is much easier to recognise anomalies and (intended) adjustments to the original design.

Regarding antique architecture, the metrological analysis can only take place after conversion of the modern measurements (in metres and centimetres) to the ancient standard measure that was used at the time of construction of the studied objects. For Pompeii, Heinrich Nissen proposed at the end of the nineteenth century that the value of one Oscan foot equals 27.50 cm[25]. By setting an absolute value for the measurement of one Oscan foot, Nissen did not allow for any variability in the Oscan unit of measure. We know, however, of

[22] Ibidem, 53.
[23] Peterse 1984, 14-15.
[24] Geertman 1984a.
[25] Nissen 1877, 88-97.

the existence of different standard measures for Roman feet, as eight slightly different units of measure were found in Pompeii and Herculaneum, varying in length from 29.25 to 29.70 cm. These finds are motive to assume that this variability also existed in the Oscan foot[26]. If we allow certain variability, we need to calculate the used foot measure for each individual building. A method for this calculation was first developed by Peterse[27] and then slightly adjusted and refined by Geertman to the following formula[28]:

$$\sqrt{(a^2 + b^2 + c^2)} / \sqrt{(x^2 + y^2 + z^2)}$$[29]

The conversion of the principal measurements creates the necessary data for the metrological analysis. Here, again, deviations may occur in the converted measures. If these deviations are systematic, a correction must be made in the conversion of the measurements itself. However, when these deviations are not systematic, the question arises how big the deviations between measured and theoretical values may be, and how to avoid creating an image that does not coincide with the original design by making random adjustments. In order to control these factors, Peterse has proposed two criteria[30], which are also applied in the analysis of the houses in the sample of this research:

1. A reliable approximation of the used standard of measure can only be made by regarding the total of measurements as taken in the field.
2. The meaning of the different measures that come forth from the metrological analysis can only be understood from the disposition of the building itself.

Metrological research within a broader framework

This particular method of studying the Pompeian atrium houses by analysis of their original design is a specialised research method, but one that does not need to be isolated in the wider field of studies of private architecture. In fact, research of these houses has come a long way since the traditional chrono-typological method, and the metrological analysis forms part of a much broader movement of studies concerning the form, layout and function of these houses. Over the last few decades, scholars have turned to a more contextual approach of studying the various aspects of private architecture from different viewpoints. Combined, the results of these studies give an insight in the social history of these houses, as well of society at large. The different angles of research, focussed on the use,

---

[26] Peterse 1984, 10; Peterse & De Waele 2005, 198.
[27] Ibidem, 16-20.
[28] Geertman 1989, 161.
[29] In this formula, a, b and c stand for the measurements expressed in centimetres and x, y and z stand for the ideal value of the same measurements, converted to Oscan feet by Nissen's value of 27.50 cm. For example: the length of the atrium of the Casa dei Vettii measures 1104 cm, which equals 40.15' when divided by 27.50 cm. The ideal measure of the length of the atrium in Oscan feet can be reconstructed as 40'; the width of the atrium of the Casa dei Vettii measures 832 cm, which equals 30.25' when divided by 27.50 cm. The ideal measure of the width of the atrium can be reconstructed as 30'. The arithmetic average of the Oscan foot in this case measures: $\sqrt{(1104^2 + 832^2)} / \sqrt{(40^2 + 30^2)} = 27.64$ cm. The values used in the equation are squared, in order to reduce the influence of the higher margin of error in the measurement of the shorter distances.
[30] Peterse 1984, 11.

function and social meaning of the atrium house, of which the metrological analysis also forms part, is explored and discussed in chapter V.

Previous research on the design of atrium houses

In the field of metrological research of Pompeian atrium houses, two scholars in particular, Kees Peterse and Herman Geertman, laid the methodological foundations. A comparison between the two is particularly interesting since Peterse and Geertman each follow a different school of thought on the methods used by antique architects in their designs of Pompeian atrium houses.

In his publication of 1984, Peterse[31] discussed his research on five of Pompeii's larger atrium houses[32] and presented a method for the calculation of the value of the Oscan foot that was used in each particular building, a refinement on Nissen's standard value of 27.50 cm[33]. Furthermore, by analysing the principal measurements of the house and their relationship to each other, Peterse aimed to reconstruct the design of these houses. His analyses led him to conclude that, despite the obvious architectural unity that exists within the houses, a clear proportional model is lacking and the design of the houses was not based on fixed prescriptions, but on other factors such as traditional building methods, the situation of the building ground and individual circumstances. Although each design reveals many proportional relationships, Peterse did not recognise a unified system that connects them. He also emphasised the presence of fixed measures within each house for some spaces, such as the depth of the alae (around 12'-13') and of the tablinum (around 20'-21').

In later publications, Peterse carried out a detailed metrological analysis of the Casa di Pansa (VI 6,1)[34] and of the Casa del Labirinto (VI 11, 8-10)[35]. On the design of the first he concluded that it was based mainly on rational proportions (i.e. 1 : 2, 3 : 4, 5 : 6), expressed in round foot measures. However, according to Peterse, the approximation in round foot measures of a geometric proportion of 1 : √2 and of the *sectio aurea* also played a part. Again, in his reconstruction of the design of the Casa del Labirinto, he came to the conclusion that the architect worked with rational proportions, starting with the principal lines of the design and finishing with the more detailed measurements. According to him, the use of these rational proportions was limited by the existence of set measurements for the alae and tablinum and the width of doors in the Samnite building practice, leaving only the shape and size of the atrium as a variable factor in the design. Peterse believes that the architect's main objective was to come to a rational disposition, considering the measurements of the plot of building ground and the set measurements that were dictated by tradition. The ultimate goal

---

[31] Ibidem, 9-30.
[32] These houses are: Casa di Sallustius (VI 2, 4); Casa dei Vettii (VI 15, 1); Casa delle Nozze d'Argento (V 2, i); Casa di M. Obellius Firmus (IX 14, 4); Casa dei Cei (I 6, 15).
[33] Supra n. 23.
[34] Peterse 1985, 35-56.
[35] Peterse 1991, 71-85.

would have been to create a coherent system of rational proportions that included the relations between the principal measurements of the house[36]. Peterse also analysed the design of the Casa degli Scienziati (VI 14, 43) and compared it to the designs of two other atrium houses, the Casa del Chirurgo (VI 1, 10) and the Casa del Naviglio (VI 10, 11), houses that he considers to be of a similar building date[37]. In these three houses, Peterse recognised a standardised design, which was based primarily on an adding together of functional values, which for practical reasons were fixed in unbroken multiples of the Oscan foot[38]. The idea of the existence of a standardised design, as well as the method of design used by the architect will be further explored by the author in detail in Chapter V.

Geertman[39], in his analysis of the five atrium houses that had been measured by Peterse, focused more specifically on the reconstruction of the method of design applied in these houses. This line of research can, according to Geertman, only be pursued if we can make use of a model that is likely to have been used within the antique design practice. Such a model, and a common phenomenon in antique architecture, is the geometric design. Geertman's hypothesis and the premise of his research is the idea that the geometric procedure of design was applied in the Greek and Roman world, a view that is supported by ancient sources as well as by several geometric analyses of ancient buildings. For the results of these analyses to be valid he drew up the following two criteria[40]:

1. The reconstructed design must reflect a unity of ground plan and build-up, preferably based on one building element, which is used as a module by the architect.
2. The construction lines of the reconstructed design must portray a logical and practical articulation that can be directly related to the building process at the building site[41].

In the analysis of the group of five Pompeian atrium houses, Geertman put this hypothesis to the test and concluded that the geometric method of design was indeed applied. He also came to realise that the antique architects working with this method of design not only made use of direct geometric systems, which are relatively easy to recognise, but also worked with arithmetic approximations of those geometric values that are irrational[42]. The advantage of the use of arithmetic approximations to express a geometric value, even though they can never be completely accurate, is the fact that the approximations render those values that cannot be expressed in round measures usable within a system of arithmetic values[43]. For example the geometric value $\sqrt{2}$ (1.4142136) can be approached by

---

36 Peterse 1993, 80.
37 Peterse and de Waele 2005, 198-219.
38 Ibidem, 216.
39 Geertman 1984a, 31-52.
40 Ibidem, 32.
41 Geertman 1989, after Rakob 1973.
42 Geertman 1984a, 33.
43 For a detailed explanation of the arithmetic approximation of a geometric proportion, see Chapter 4 Ancient Mathematics.

the following arithmetic approximations: 5/7 or 12/17[44]. In his later publications on the design of round temples and the design of temple doors[45], he further elaborated on the use of arithmetic approximations in antique design. One of the conclusions of his study is that the use of different approximations for the expression of one geometric proportion (e.g. the use of 5/7 and 12/17, both expressing 1:√2) in one design was common practice. This presence of more than one approximation of the same geometric proportion can, according to Geertman, be explained as an indication of a conscious use by the architect of the arithmetic peculiarities of the different approximations. This is partly to exploit the opportunities of the system itself, for instance for the combination of the decimal and duodecimal systems, and partly based on the architect's free choice in order to introduce differentiation within the design[46].

In the summary of his analysis of the Pompeian houses, Geertman defined the five houses and their designs in the following way[47]: the central part of the house is formed by the atrium and its impluvium. The length and width of the atrium are divided into three parts by the impluvium. Around the atrium we can find the following spaces: the part of the house in front of the atrium with the fauces, the spaces on either side of the atrium with the alae and the part of the house behind the atrium with the tablinum. These parts of the house that surround the atrium also create a tripartite division of the length and width of the ground plan, which all have a proportional relation to the central part of the house.

The atrium and its division into three parts along the width and three parts along the depth by the impluvium form an important aspect of the design. Geertman recognised the following models to determine the dimensions of the impluvium:

1. A regular division: the length and width of the atrium are each divided into three equal parts.
2. A dynamic division: the length and width of the atrium are each divided into parts with the following proportions: 1 : √2 : 1.
3. A combination or variety of (1) and (2).

Comparing the different approaches of Peterse and Geertman and their respective results, there may at first sight appear to be a rigid distinction between their 'schools of thought', the first upholding a system of clear arithmetic proportions and practical considerations, the second preferring a system of arithmetic approximations of geometric

---

[44] The arithmetic approximations that were used in antique architecture belonged to a sequence that was known in Pythagorean and later antique mathematics as the arithmetic expression of geometric proportions. A well-known example is the Pythagorean sequence, transmitted by Theon of Smyrna (early second century AD), which reflects the proportions 1 : √2 : 2. These values represent the side of a square, the diagonal of that square and double the side of that square. Theon of Smyrna's sequence of arithmetic approximations of this geometric proportion can be expressed as follows:
1 : √2 : 2 = 1 : 1 : 2 = 2 : 3 : 4 = 5 : 7 : 10 = 12 : 17 : 24 = 29 : 41 : 58 and so on (Frey 1990, 289-292; Geertman 1993, 235). Also see chapter III for a complete discussion of the ancient mathematics applied by architects.
[45] Geertman 1989; 1993.
[46] Geertman 1993, 235 and 239.
[47] Geertman 1984a, 48-49.

figures and proportions. However, regarding the methods and results of these two researchers as scientific opponents, both advocating a different system without any consideration for each other or other significant factors in the design process, would be to overemphasise the differences between them and drawing them to an extreme[48]. Geertman's recognition of the use of a geometric-arithmetic system of design in Pompeian atrium houses does not elevate them to a high and incomprehensible theoretical level of design, far removed from Peterse's practical considerations. On the contrary, Geertman repeatedly draws attention to the fact that the geometric-arithmetic design process takes place on a number of different levels, from building practice and traditions and a design-technical level to that of theoretical-aesthetical considerations[49]. The use of arithmetic approximations to express geometric proportions was a practical and commonly used method in ancient architecture, readily applicable for construction on site, while also usable on a theoretical and technical level. Furthermore, there was indeed an 'overlap' between the purely geometric and the purely arithmetic methods of design[50]. Both methods were probably part of an architect's curriculum, taught to him during his period of training and education and ready for him to use.

Richard de Kind[51], who studied the general layout of the city of Herculaneum, as well as the more detailed designs of houses in the insulae III and IV, did similar research to that by Peterse and Geertman. From his analysis, he concluded that the 'complete atrium' was not the standard house type in Herculaneum. According to him, the design of the houses appears mostly to be a direct result of the width of the available plot of land, whereby the builders worked with clear, usable proportions of length and width or with round figures. The objective of the architect would be to come to a suitable and balanced division of space that could easily be realised on the building ground, without the use of any 'difficult mathematical principles'. This was accomplished by choosing a layout that was built up of different strips of space, in which the living and service areas were situated. These strips are considered by de Kind to be modules that could be combined with each other in different ways[52].

De Kind's methods and conclusions raise serious doubts. As he himself explains, he searches for clear proportions or round figures when analysing a design. This method implies a focus on the recognition of round foot measures in separate values within the house, rather than a focus on their systematic coherence. As discussed earlier, the validity of the

---

[48] This sharp contrast is made by Wilson-Jones (2000, 2; 50), who also warns us that "overblowing the contrast between arithmetic and geometry is a modern, post-renaissance, preoccupation that was not part of ancient architectural practice". The same concept of unity between geometry and arithmetic is stated by Geertman (1993, 239): "Più che una geometria espressa aritmeticamente questa è infatti una progettistica architettonica basata contemporaneamente sulla geometria e sulle caratteristiche aritmetiche dei vigenti sistemi numerici (decimale, dodecimale, sedicesimale). Tale combinazione conferisce al sistema un eccezionale flessibilità".
[49] Geertman 1989, 163; 1993, 245.
[50] See also Wilson-Jones 2000, 87.
[51] De Kind 1998.
[52] Ibidem, 256-71.

metrological research relies, at least in part, on the modern researcher reviewing coherent measurements in the total design. Following this methodology allows us to recognise the underlying system and filter out any anomalies that may have slipped in during different phases of the ancient construction process as well as the modern analysis. Attaching particular value to single measures merely because they happen to be expressed in a 'round' figure and thereby disconnecting them from the proportional system that created their right to exist, turns the metrological analysis into a meaningless exercise. In his mission to find round foot measures in the designs of the houses he analyses, De Kind introduces Roman (' R) feet next to Oscan (' O) feet at random in one design, whenever the one or the other produces a round figure. For instance, De Kind reconstructs the division of space along the west side of the atrium of the Casa dell'Erma Di Bronzo as follows[53]:

4' (O) – 4' (O) – 10' (R) – 3½' (R) – 4½' (R).

Whether or not these different Oscan and Roman feet can be found next to each other in such a small area, introducing these Roman feet does not add any value to the analysis of the original design, as the parts of the house that were presumably constructed in Roman feet were added to the original Oscan structure at a later date. Thus, his conclusions based on the oldest parts of a house as well as younger additions, do not provide us with relevant information on the original design. Finally, I strongly disagree with the remark made by De Kind in his conclusion, stating that no difficult mathematical principles were applied in the design of the atrium houses in Herculaneum that were part of his sample. This remark appears to me to be the reflection of the thoughts of a twentieth century archaeologist onto the profession of architecture and design in antique Herculaneum. The fact that certain mathematical principles, such as the rational approximation of irrational proportions, are perceived as difficult by a modern archaeologist does not mean that they were not a common phenomenon in ancient mathematics.

Choice of material

The material that has been collected during the campaigns of the project in Pompeii consists of nearly 30 files with complete measurements of the houses, by archaeologists and geodesy experts, and descriptions of the building materials and techniques. Out of this database, a selection of eighteen houses was made for this research, based on several criteria. The first important criterion for conducting a comparative study of the designs of houses is that these houses were built in roughly the same period in history. The general consensus amongst modern scholars is that these houses originate in the second century BC, at which time Pompeii was still a Samnite town. The second criterion was to choose big houses that can be considered to be representative of dwellings of the elite. In the case of these large houses, it is most likely that their construction was based on an architectural design, which

[53] Ibidem, 164.

may not have been the case in smaller houses. A third criterion was that all of these eighteen atrium houses have a peristyle-garden at the back, which was also measured and described during the campaigns in Pompeii. By including the peristyle-gardens in the analysis of the designs of these houses, more insight can be gained in the relation between the design and time of building of the atrium house and its peristyle-garden. The following relations between atrium and peristyle are possible:

1. Atrium and peristyle were built at the same time and can either form a unity in design and building material, or were built along a different method of design.
2. The peristyle was added at a later date but built in the same tradition as the atrium house.
3. The peristyle was added to the atrium house at a later stage in its building history and was built in a different building tradition.

The combined study of building history and metrological analysis will introduce some nuances to the general opinion that was voiced already by Nissen at the end of the nineteenth century: "*Columns did not exist in the oldest phase of building; not one peristyle-garden originates in this period. In most cases, the peristyle houses in Pompeii were developed when several atrium houses were joined together. All the walls in peristyles that can be dated to the oldest building phase (opus quadratum/africanum) originally belonged to another atrium house that was transformed into a peristyle at a later date.*[54]"

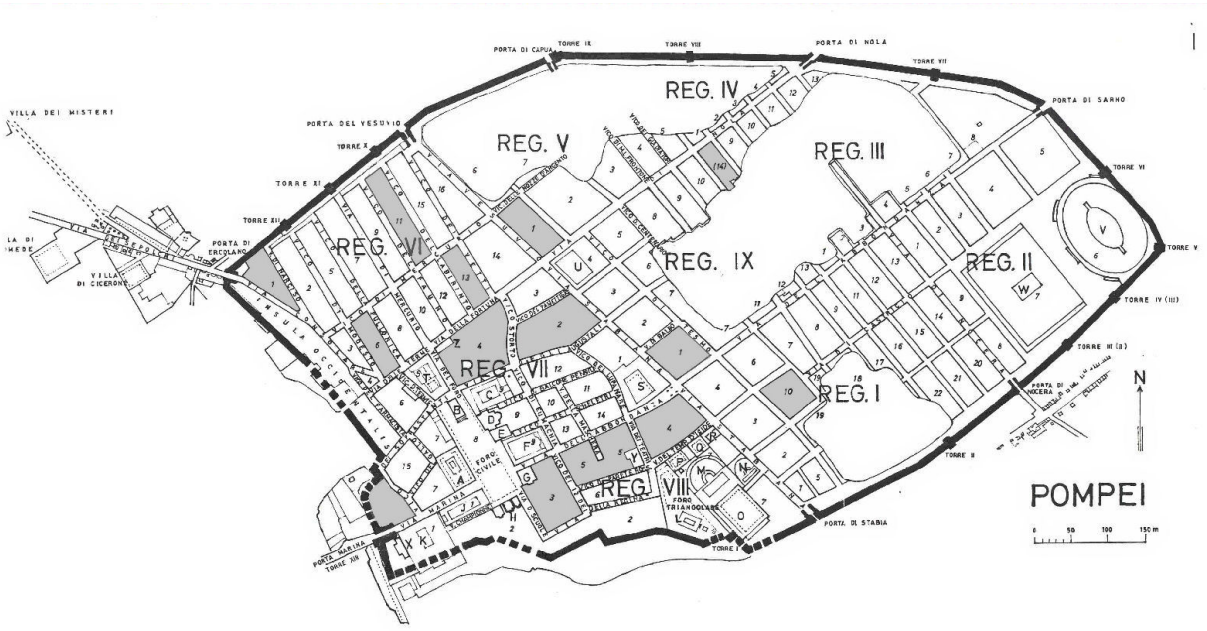


Figure 7: Position of the houses in the city plan (insulae highlighted) (after Eschebach1970)

[54] Nissen 1877, 400.

CHAPTER II

VITRUVIUS' *DE ARCHITECTURA*
THE USE OF AN ANCIENT SOURCE ON ARCHITECTURE

Introduction

Vitruvius (ca. 90 – ca. 20 BC), a Roman architect, civil servant and author who was educated in the cultural and political climate of the late republican period, wrote a treatise on architecture called *De architectura*, a work which is considered to be a general guide to the building practices and traditions used in Vitruvius' age. This classical work has since long played an important role in the study of Roman architecture. Pompeii's houses, which often predate Vitruvius' writings by over a century, have often been compared with Vitruvius' rules and methods of design. This comparison raises as many questions as it does answers and we need to consider whether it is justified and if so, to what extent.

The entire treatise consists of a total of ten books, which cover a wide range of topics, including general architectural principles and the process of design, and more specifically public and private architecture, interior decoration, water-supply, dials and clocks as well as mechanical and military engineering[55]. From this extensive source, some parts are particularly relevant for the present study of domestic architecture. In Book I, Vitruvius deals with the architect's education (chapter 1) and with the general rules and process of design (chapters 2 and 3). Books III and IV are dedicated to temples, but are also significant for the general theoretical background of the design-process. Most relevant is Book VI, which is entirely concerned with the architecture of houses, discussing topics such as disposition, proportions, measures, different parts, orientation and the adaptation of houses to their owners.

The study of *De architectura* in relation to real antique architecture must be based on an understanding of the work itself, and more specifically an understanding of the writer's intentions, which are closely related to his intended public.

Vitruvius' objectives

The question of Vitruvius' purpose and intentions in writing this comprehensive work on architecture is complicated. To understand the work of this man it is necessary to have some idea of the intellectual climate that he was a part of and played an active role in. To find this period in history we need to start with the time of Vitruvius' formation, the period in which he was trained as an architect both in theory and practice. Most likely, this took place in the fifties BC, as in his preface to Book IX Vitruvius' mentions his own teachers and his contemporaries: Lucretius, Cicero and Varro. Although this period in history, the late-

---

[55] For a detailed description of the contents of *De architectura* see Fleury 1990, xxiv-xxv.

Republican period, may not have been the most original in the history of western thinking, it was certainly a time of great scientific and philosophical activity. It is in this context that we need to place and understand Vitruvius' ambitions[56].

1. AN ARCHITECTURAL SYNTHESIS

Regarding his intentions in writing *De architectura*, we will first consider the reasons, given by the author himself[57]. In his dedication (I praef., 1-3) to the *Imperator Caesar* -probably Augustus- Vitruvius declares to have written this treatise for him, as he felt obliged to do so, and also to enable the emperor to appreciate the architecture of the public buildings surrounding him. At the end of the first chapter (I 1, 18), Vitruvius offers much wider perspectives, aiming his words not only at Octavianus, but at all those who construct (*aedificantibus*) and mostly at all savants (*sapientibus*). In doing so, Vitruvius characterizes his work as ambiguous, being, on the one hand, a practical guide for the use by builders and, at the same time, a treatise on architecture for a learned public. At the end of the preface to Book I, Vitruvius adds yet another reason for writing *De architectura*, stating that he would do what no man before him had tried by creating a synthesis, a total and comprehensive work covering the entire field of architecture (*omnes disciplinae rationes*)[58]. Vitruvius' originality is thus mostly formal, as he himself admits that he does not pretend to add something new to the existing technical treatises, but tries to create order in an existing tradition[59]. The fact that the architectural practice and theory of his time is the result of a historical tradition, consisting of both knowledge and know-how, which developed progressively over time, is a frequently recurrent theme in Vitruvius' work[60]. With his writings he attempts to realise, in the form of a systematic exposition, a sort of typological and proportional display, capable of providing those who direct construction works with a useful normative framework[61].

2. PROMOTING THE ARCHITECT'S PROFESSION

Gaining acknowledgment for the profession of the architect from the wider public may also have been an incentive for Vitruvius in writing his *De architectura*. In the first paragraph of the first book, Vitruvius describes the education of an architect. The main subject in this education was the art of architecture itself (theory and practice), but other, secondary subjects, belonging to the so-called *artes liberales*, were also included in the architect's education. Together these subjects form the *encyclios disciplina*, the total of sciences, of which architects should have a general knowledge. Vitruvius' aim in this first chapter may have been to show how closely connected theory and practice are, and how the profession of architects cannot be separated from the structures of society[62]. His description of the architect's

---

[56] Schrijvers 1989, 13.
[57] Fleury 1990, xxx-xxi
[58] Frézouls 1989, 39.
[59] Gros 1990, xl.
[60] Frézouls 1989,43.
[61] Gros 1990, xxvi.
[62] Geertman 1997, p. 18.

education shows the reader that the profession of architecture was closely related to other sciences and thereby also demonstrates the position and status of the architect and architecture[63]. One does slightly get the feeling that this encyclopaedic knowledge is mostly a façade, as the necessity of all the different disciplines mentioned by Vitruvius is not immediately apparent for the profession of the architect, and appears to be mostly a matter of prestige[64]. Besides what Vitruvius tells us, we are unfortunately not very well informed on what the profession of the antique architect actually entailed. Literary sources are scant and contradictory in their information, and only a few names of architects have survived[65].

3. THE INTENDED PUBLIC

We already noted that Vitruvius himself declared to have written *De architectura* for all those who construct (*aedificantibus*), but also more in general for all savants (*sapientibus*). The lack of, often essential, detailed information means that it was not a professional guide for architects and engineers as we would know it. This does not mean, however, that it did not hold much useful information for all those who already had a certain amount of knowledge on the subject, and thus possessed a referential framework. Vitruvius wrote his treatise for a mixed audience, consisting of interested laymen, a group that may have consisted of civil servants as well as private clients, those in training and those already active in the architectural profession[66]. The combination of these components were crucial to Vitruvius in deciding which subjects were presented, what kind of language was used to do so and in which way the subject matter was presented[67].

The use of De architectura *in the study of private architecture*

As was mentioned above, one of the characteristics of *De architectura* is that it covers such a wide range of topics, regarding both the profession of the architect and the general discipline of architecture in antiquity. We now need to decide which elements of this comprehensive work in particular may offer us information in the study of private architecture, and therefore be of help in creating a more comprehensive picture of the building-process and an historical framework of the houses in Pompeii that are studied here. The relevant sections of *De architectura* will be discussed here in two separate sections, the first covering relevant general theoretical topics, discussed by Vitruvius in different chapters of the treatise, the second regarding more specific topics, directly related to private architecture, described in chapter VI.

---

[63] Compare Callebat 1989, 34-38; 1994, 31-46.
[64] Frézouls 1989, 39.
[65] Fleury 1990, lxxxix
[66] Geertman, H. 1993, 245.
[67] Vitruvius' presentation of the subject matter and the problems that modern researchers come across in interpreting it, are discussed in detail in Chapter 4.

1. GENERAL THEORETICAL TOPICS

The general theoretical framework that is relevant to both public and private architecture is that which underlies the process of design, i.e. the different phases of designing, decision-making, altering and adjusting that an architect had to go through each time he created a design, in order to come to a desirable and acceptable end-result. This process of design is described in a rather detailed manner by Vitruvius in Books I, 2 and I, 3.

In Book I, 2, Vitruvius creates a division of architecture in six parts and gives the definition of each: *ordinatio*, *dispositio*, *eurythmia*, *symmetria*, *decor* and *distributio*[68]. He describes the process of design as taking place in two general phases; the first phase regards the making of the design by the architect, in which the conditions were defined, which would ensure the accomplishment of the desired characteristics of the building in the second phase. Phase two consisted of the building activity and the completed structure. Vitruvius' description of the process of architectural design and the presentation of its parts has been brought together by Geertman in an explanatory chart, clarifying the purpose of the different parts of the design process and stressing the relations that exist between them[69].

Structure of the process:	***quod significat*** ⇒ Purposeful actions/ active factors	***quod significatur*** intended properties
Quantitas Quantative process of design, design as a mathematical entity Mathematical calculation.	***Ordinatio*** ⇒ Mathematical arrangement ⇓	***Symmetria*** Metrical coherence ⇓
Qualitas Qualitative process of design, design as a conceptual and aesthetic entity Effective elaboration.	***Dispositio*** ⇒ Conceptual three dimensional arrangement (*ichnographia, orthographia, scaenographia*) ⇑	***Eurythmia*** Visual coherence, harmony. ⇑
Auctoritas External factors, architectural form as social agent Destination	***Distributio*** ⇒ (a) economical and technical (the production) (b) social-economical (the consumers)	***Decor*** Acceptance of materials, form, arrangement and setting

Table 1: The architectural design process according to Vitruvius (after Geertman) [70]

[68] Fleury 1990, lxxiv
[69] Geertman, H. 1994, 22; 1997, 19; see also Schoonhoven 2006, 16-17.
[70] Geertman 1994, 22; 1997, 19; see also Schoonhoven 2006, 16.

The columns of the chart present a division between the desired characteristics of a design (*quod significatur*) and the course of action that is necessary to acquire these characteristics (*quod significat*). The horizontal differentiation of the chart concerns three other Vitruvian terms or concepts: *quantitas*, *qualitas* and *auctoritas*, which are interpreted by Geertman as respectively the mathematical calculation, the effective elaboration of the design and external influences on the design. Rather than reading the chart as a top-down hierarchy of importance or chronology, the arrows indicate how the first and third level both contribute to the perfection of the design and its execution.

In Vitruvius' description, the starting point of an architectural design took place on the level of the *quantitas*. Here, a strict mathematical arrangement (*ordinatio*) ensured the metrological coherence (*symmetria*) of the design. This first level of mathematical perfection was necessary to reach the ultimate goal of visual coherence and harmony (*eurythmia*). On the second level of design, the *qualitas*, the conceptual three-dimensional arrangement of the design and the subsequent execution of the building plans took place (*dispositio*). However, before the desired state of *eurythmia* of the design could be reached, the architect needed to reconcile the mathematically perfect system of proportions (*ratio symmetriarum*) of the *ordinatio* with certain external factors (*distributio*). These external factors consisted of both practical considerations, such as the restrictions and demands of the site and the production of building materials, as well as social considerations, such as the particular wishes of the owner. Any of these external factors could force the architect to leave the mathematical perfection of the original design and make the necessary corrections (*detractiones aut adiectiones*) to produce the right balance and ensure social acceptance of the design. This process of adapting the mathematically perfect design in order to create visual perfection is described by Vitruvius as a special skill that a good architect needed to acquire[71]. In summary, the desired and-result of *eurythmia* is reached by a combination of the first level of design, the *ordinatio* and the third level of design, the *distributio*. The total design can only be valid by combining both technical and social values.

Book I, 3 formed the next step in the definition of architecture as a social phenomenon. Vitruvius describes the different fields in which architecture was applied, namely public, private or religious. He also introduces three standards for the assessment of a design[72]:

1. *Firmitas*, a standard used to assess the building construction and materials
2. *Utilitas*, the assessment of the practical and functional division of space
3. *Venustas*, a standard to assess the composition of the design

Apart from chapters 2 and 3 of Book I, certain elements of Books III and IV, although dedicated to the architecture of temples, are also significant as far as the general theoretical background of the design-process is concerned. Even though Vitruvius' expression *de aedibus sacris* (*deorum immortalium*) is considered the heart of the matter in all the different versions of

---

[71] *De architectura*, VI 2, 1.
[72] Fleury 1990, lxxiv-lxxv; Geertman 1997, 20

his treatise that have come down to us, the concepts that form the centre of the author's preoccupations from the first lines of Book III, 1 (*symmetria*, *proportio*, *ratio*) and that effectively organise most of the developments until the end of Book IV, suggest the essentially theoretical character of these two volumes and the relatively abstract nature of their intent[73]. Book III, marking the beginning of the longest section of the entire treatise, that regarding *aedificatio*, contains not only an explanation of the first principles concerning the building of temples, but also the elements of a general introduction, that is to a certain extent valid for all constructive practices[74].

2. TOPICS RELATED DIRECTLY TO PRIVATE ARCHITECTURE

Of the total of ten books, the most relevant for this research is book VI, which is entirely devoted to private architecture and is of great significance in the study of this field in (pre-) Roman Italy[75]. It starts with information on the choice of a particular construction site, possible adjustments of the construction to geographical circumstances and the influence of climate on architecture (VI 1). Vitruvius then continues with a discussion of the system of measures and corrections and an explanation of the importance of proportions in building (VI 2).

In the third chapter of book VI, Vitruvius gives his most concrete information on the plan of courtyard or atrium houses. First, he names the five different styles of atrium houses, and their respective names: Tuscan, Corinthian, tetrastyle, displuviate and vaulted. He then proceeds by summing up the different possibilities for planning the length and width of the main spaces in the house: the atrium, the alae, the tablinum, the fauces, the peristyle, triclinia, exedrae, oeci and pinacothecae, and the position of windows.

In chapter 4, Vitruvius gives his prescriptions on the orientations of specific rooms within the house. For example, the spring and autumn dining rooms should face east, while the summer dining rooms should have a northern aspect.

3. THE SOCIAL CODES OF PRIVATE ARCHITECTURE

Besides giving his readers prescriptions on the practical and theoretical sides of private architecture, such as the influence of climate, the dimensions for each room and their preferred orientation, Vitruvius also pays attention to the social considerations for an architect when constructing a private building, in particular in chapter 5 of book VI. Here, he repeatedly emphasizes that a good architect was expected to design a house that befitted the status and profession of the house owner, who needed a house that would comply with his particular needs as well as with the expectations of society. After all, as he puts it, the eminent and wealthy members of society required a totally different kind of residence than those with a less conspicuous role in society. He also draws attention to the particular

---

[73] Gros 1990, vii
[74] Gros 1990, xvi
[75] For a detailed commentary of the contents of Book VI, the author refers to the introduction by Callebat 2004, x-xii

planning of rooms within a house, stating that certain 'private' rooms were not to be entered uninvited, whereas others were meant to be shared with visitors[76].

Vitruvius' designs and their correspondence to reality

Starting at the end of the nineteenth century, studies of houses in Pompeii, conducted amongst others by the early *pompeianisti* Nissen and Mau, were mostly aimed at comparing Vitruvius' prescriptions for the dimensions of atrium houses to those found in real architecture[77]. In these early comparative studies, the measures that were prescribed by Vitruvius to be used in the dimensions of houses were often taken literally and compared directly to measurements that were made in the field. However, more recent studies have made us realise that many factors should be taken into consideration before Vitruvius' writings can be studied in relation to ancient architecture.

In the field of ancient private architecture, the number of studies conducted with these considerations in mind remain rather scarce up to the present day. Regarding the study of atrium houses in particular, three people, namely Geertman, Hallier and Peterse have done a considerable amount of research and will be discussed briefly. In 1984, Geertman[78] published a study in which he confronted his findings on the designs of five Pompeian atrium houses to Vitruvius' rules on the dimensions of the spaces around the atrium. The general characteristics of the five houses appeared to be narrow fauces and relatively wide alae and tablina, whereas Vitruvius' models show the reverse effect. Another contrast seemed to exist in the fact that the dimensions of the five houses could all be recognised as products of a geometric-arithmetic system, while Vitruvius' figures appear to be the result of solely arithmetic proportions. He appears to show us in his rules a second system of more rough numerical reports that are further removed from the geometric system, but can still be recognised in their context as having developed from that system. Geertman[79] then widened his research by studying several round temples and temple doors in Latium, dating to around 100 BC and confronted his findings to Vitruvius' rules of temple design. The proportions that characterise the different designs could be placed in relation to each other as well as to Vitruvius' rules of design. This means that these proportions were not of an incidental nature and that their mathematical coherence had a constructive meaning. They are a sign of antique design methods, within which architects developed their individual designs. Geertman suggests that the differences that occur between reality and Vitruvius' rules are a result of the way in which Vitruvius has selected and presented his subject matter. Many of the figures in Vitruvius' instructions have no structural meaning, when taken at face value, but are the arithmetical results of a chosen model that is not discussed in itself. Vitruvius often impairs the essence of that model in order to simplify matters for his public. The

[76] These social aspects of the house and the hierarchy of rooms within it will be discussed in detail in chapter 5.
[77] Nissen 1877; Mau 1879
[78] Geertman 1984b
[79] Geertman 1989; 1993; 1997

simplified instructions and rules that Vitruvius gives in his treatise do not allow us to get an insight into the hierarchy of the system of design. However, enough characteristics remain for us to retrace the steps in the design proposed by Vitruvius and to identify the system that lies behind it.

A similar confrontation of Vitruvius' prescriptions to real architecture was made by Hallier, who drew a comparison between Vitruvius' rules on the dimensions of Tuscan atria (VI, 3, 3) and a number of antique houses that he studied at the sites of Pompeii, Herculaneum, Ostia and Marzabotto[80]. To these he added several more isolated examples, which he reviewed from literature, situated in Alba Fucens, Cosa, Grumentum, Luna and Saxa Rubra. Lastly, he included four examples from outside the Italian peninsula, with examples found in Bibracte, Ampurias and in the Herodion of Judea. Of the total group of around a hundred houses, Hallier found that the relationship between the width and length of the Tuscan atrium followed the rules as prescribed by Vitruvius in VI, 3, 3 in just over one third of the cases.

Peterse starts his article in the publication of the Vitruvius Congress in Heerlen[81], by stating that there are obvious similarities between the architecture of the atrium houses in Pompeii and Vitruvius' rules, even though those houses often already existed for at least one century by the time Vitruvius wrote his treatise on architecture. This seems to indicate that Vitruvius did portray a widespread and slowly developing building tradition based on reality. However, studies that have compared Vitruvius' writing with the houses of Pompeii have shown that there are at least as many differences as there are similarities. As Peterse[82] clearly shows, the proposed series of proportions for planning the length and breadth of the alae, tablinum and fauces cannot have been applied in reality. The principle that is described by Vitruvius in Book VI is that of regressive growth, which means that the width of the rooms along the atrium increases as the size of the atrium itself increases, but on a regressive scale. This principle is based on considerations of both functionality and of architectural coherence. The considerations that underlie this principle of regressive growth can very well have been derived by Vitruvius from the traditional architectural practice that existed in the Late Republic. Or, in other words, this principle was actually used in practice and not made up by Vitruvius in his treatise. However, Peterse believes that Vitruvius could have introduced the series of proportions that he suggests, with the sole purpose of illustrating the general principle of regressive growth. In that case, we should not expect them to exist in reality, because they were only invented and used by the author to explain to his readers the underlying principle.

---

[80] Hallier 1989, 194-211
[81] Peterse 1997, 39
[82] Ibidem, 40-41

The use of De architectura *as a source: considerations and conclusions*

As was described above, a confrontation of Vitruvius' prescriptions for private architecture with the actual remains of antique houses, often leads to as many problems as it does to solutions. The question that now remains is whether the use of Vitruvius' *De architectura* as a source in any type of research of antique architecture is justified. I will state that it is. In fact, I will go so far as to say that excluding *De architectura* from this type of research would mean denying a wealth of information on the subject, which no other source can offer us. The difficulty, however, lies in finding a way in which to 'safely' use Vitruvius in relation to the archaeological remains. To be able to do so, a profound understanding of the nature of his writings is crucial. Unlike the earliest studies, directly comparing Vitruvius' writings to the architecture from sites such as Pompeii and Herculaneum, more recent research is focussed on placing these different sources in a broader historical context, refraining from making a direct analogy between them[83].

One of the problems in studies including both Vitruvius and architectural remains as a source, is their historical value. Critics often emphasize the large gap in time that exists between the Pompeian atrium houses, dating to around the second century BC, and Vitruvius' prescriptions for this house type, dating to the end of the first century BC. If Vitruvius' treatise was only a limited report of the architectural trade, confined to the short period in history that was marked by his own career, then indeed the two sources cannot be brought together in a broader historical context. If, however, Vitruvius' prescriptions can be considered as representative for a longstanding tradition, and Pompeian houses are more than just a reflection of local building tradition, then each source may be used to explain the other[84]. As far as the architectural tradition of Pompeian atrium houses is concerned, there is now more than enough evidence supporting the fact that it is not based heavily on local characteristics. On the contrary, the atrium house as a house-type was widespread over the entire Italian peninsula. Over time, its expansion increased even further outside the borders of its homeland Italy into the outer regions of the Roman Empire[85]. In his prescriptions on atrium houses, Vitruvius is quite explicit about the proper layout and proportions of the most important individual room, but offers no exact explanation on how they fit together. Apparently, he is describing a well-known and widespread genre in his time. Unless his fellow architects were well familiar with the layout of the atrium-peristyle house, his guidelines would have been of little use to them. This implies that the Pompeian atrium houses were representative not only of a broad architectural tradition, but also of the particular type of townhouse referred to by Vitruvius[86]. Regarding the nature of Vitruvius' work, he himself draws our attention to the fact that his treatise is not just a reflection of the status quo in the architectural profession at the time of his career. According to him, one of the reasons for

---

[83] On the methodological questions on using Vitruvius as a source, see also Wallace-Hadrill 1994, 15.
[84] Peterse 2005, 164.
[85] The development and spread of the atrium house and the ongoing research in this field will be discussed in detail in Chapter 4.
[86] Peterse 2005, 176.

writing his books was to create a synthesis, an encyclopaedic work on the architectural traditions that had existed for generations of architects before him[87]. This statement in fact is crucial to us, as it not only underlines the originality of Vitruvius' work – as he himself argues that no man before him had ever attempted such a task -, but means that *De architectura* was an ordered summing-up of an entire architectural tradition until the end of the first century BC[88].

In conclusion, we can say that even though *De architectura* was written by an architect in Rome during the third quarter of the first century BC, at least a century later than the construction of the Pompeian atrium houses, it can indeed be used as a written source in the archaeological research here presented. Vitruvius' treatise consists of his own selections, preferences and discussions on matters of design practice and tradition that existed within his profession. *De architectura* can be regarded as a work reflecting the real state of affairs, a general image that had already existed for many generations of architects, in which Vitruvius did not introduce new systems, but simplified the existing tradition of geometric and arithmetic methods of design to the extreme. His prescriptions on design form part of a broader, general system that was common knowledge for his contemporaries and the architects of previous generations[89]. It is within this long-standing architectural tradition that the atrium houses of Pompeii can also be placed.

In this study, Vitruvius' treatise will be used as a theoretical backdrop and to form an architectural-historical framework for the analysis of the design of Pompeian atrium-peristyle houses. This means that I will not make individual comparisons between each house and the geometric-arithmetic design tradition described by Vitruvius. This would, I fear, only result in an incoherent mass of information with no real or useful meaning. From reading Vitruvius, it is clear that a building can be defined as combined interaction of spaces. The combining elements that together make up the complete building are related to each other mathematically. The architect, when designing a building, in order to create these elements, needs to use mathematical means. In the process of design, the architect plays an active role in functionally combining the mathematics and the building into one whole.

Vitruvius' writings on the design of private architecture may be a muddle of different examples, but they are also representative of a specific approach. As was mentioned above, there is no point in focussing on his detailed measures and prescriptions, as they are merely a reflection of a larger tradition. Similarly, the Pompeian houses form a collection of individual examples of private architecture. Here, too, their value in expanding our knowledge of the used methods of design lies not in them separately, but by treating them as part of a whole. Not by expecting them to all be alike and fit a certain picture, but by presupposing that they were developed within a specific framework of thinking and spatial ingenuity. In this framework, there was space not only for mathematical demands and expectations, but also for social aspects or practical and economical considerations.

---

[87] *De architectura* VI, 1.
[88] Fleury 1990, xxxviii
[89] Geertman 1993, 244; 1997, 22.

CHAPTER III

ANCIENT MATHEMATICS

A METHODOLOGICAL FRAMEWORK FOR THE METROLOGICAL ANALYSIS OF ANCIENT BUILDINGS[90]

Introduction

In our effort to understand and interpret the meaning of ancient buildings, one aspect of the analysis is to investigate the context within which that particular building functioned. This holds true for whatever aspect of ancient architecture we are studying: the use of that building confronts us with aspects such as the society that used it, and the particular social rules that dictated its use at that time in history. Or, in the case of the reconstruction of its design process, from the first conception on the drawing board to its construction at the building site, we are confronted with the architect's trade, its practice and tradition. This raises several questions such as: which methods of design were common knowledge amongst architects in the historical period and context of an ancient building? Can the design be analysed metrologically and within which mathematical tradition did the architect work? And also, what was the general practice of his time and that of his predecessors, who were his tutors? The obvious sources that can inform us on these matters are ancient literary sources as well as the surviving ancient buildings themselves.

This chapter aims to create a general framework of the mathematical principles and means that were common knowledge when the atrium houses in Pompeii were constructed (third-second centuries BC). Assuming that these principles and means were part of the architect's repertoire, this framework then provides a backdrop for the metrological analysis of these houses, making their interpretation a meaningful exercise.

Greek mathematics and the early conception of theory

In order to understand the mathematical principles used in the design of ancient buildings, we need to go back to the sixth and fifth centuries BC, the time of Pythagoras and his followers. This particular period in history was not only the time in which the ancient Greeks developed mathematics as we still use it today, it was an era of more general and profound changes in the whole intellectual way of thinking. The conception of theories in all kinds of different disciplines, from mathematics to music and philosophy, took place in these times of great changes, and it is also in this period that the conception of theories in the trade of architecture must originate. Unfortunately, none of the treatises dealing with the

[90] I would hereby like to express my sincere gratitude to Prof. J. Hogendijk, who was kind enough to read this chapter and offered me many useful suggestions on the topic of ancient mathematics.

architect's profession from the sixth century BC have survived, although they were still well known by Vitruvius. This implies that, on the subject of how the theories in the architect's discipline were first conceived, we are totally dependent on the surviving ancient buildings, which allow us to reconstruct their designs and analyse the original intentions of their constructors. Felix Preißhofen draws our attention to these problematic issues, but also provides us with an alternative route to understanding the earliest principles of architecture, by using analogies from other disciplines to define the boundaries and possibilities of the 'thinking' of that period in Greek history. For, as he puts it, all disciplines, including that of architecture, were bound by the same mental and linguistic capacities and restrictions of the time leading up to the first conception of theories[91].

A remarkable aspect of this important period in the history of mathematics was the fact that the intellectual world was greatly fascinated with numbers. Very diverse elements of the world, ranging from the limbs of the human body to the lengths of the different strings on a musical instrument, were expressed in numbers and proportions. It was in this context that new insights started to play a role, whereby the first major changes in the way of thinking took place in the sphere of philosophy. Studies of early Greek thinking have made it clear that, in the general awareness of the seventh and sixth centuries BC, the focus on the 'unit' was decisive, as much in literature as in art. In other words, the picture of the 'whole' was constructed by an addition of its different parts, a characteristic trait of early-Greek lyrics as well as other genera, whereby a list of details was named one after the other. It was by adding the different partial aspects together, that the description of a certain situation could be given[92]. A major turnover in this way of thinking was initialised when the possibility of abstraction was first invented and accepted, and we see the different partial aspects being fused together into one abstract concept. This development started in the seventh and early sixth centuries BC, with the use of the neutral plural form, such as τα καλα (beautiful things), to express a general, abstract element that comprised a group of things. However, at the end of the sixth century and during the fifth century, the level of abstraction became even higher, as people started to use the singular neutral form: το καλο (the <concept of> beautiful), to express this group of all things beautiful. A similar example is the transition from τα ὀντα (the things that are) to το ὀν (that which is). Whereas the first is still a collective phrase, the new form of a singular neutral form with a noun, is pure conceptual abstraction.

This revolutionary development in the way of thinking and expressing seems to have been crucial to the first conception of theory by the Greeks. The high level of abstraction of this way of thinking also made the different academic disciplines compatible, for the first time in history[93]. During the entire fifth century BC, a time of great experimentation in this new way of thinking and expressing, the use of the το-form saw an explosive expansion. It is during this time that the different fields of human knowledge and experience were growing

---

[91] Preißhofen 1983, 26.
[92] Ibidem, 27; De Jong 1989, 100.
[93] Preißhofen 1983, 28.

and their theories developing. The fact that the theory of architecture must also have undergone a major transformation should not be doubted, despite the lack of written testimony. As Preißhofen argues, nobody can avoid the ways of thinking of their time[94].

Until now, these considerations on the development of theory in the Greek academic world have been based exclusively on observations of a mental and linguistic way of thinking and expressing. However, the revolutionary development in the way of thinking and expressing the world not only facilitated the abstraction of the visible and the touchable, but also of the 'countable'. Consequently, these developments also had an impact on the science of mathematics, where we see a shift from the rational numbers to the irrational, or geometric proportions. We can relate this development to Preißhofen's theory as described above, and the same analogy can be made. For it is universally accepted, that the Greeks were the first to know the existence, in mathematics, of the reality that we call the irrational or irrationality. So how did the irrational present itself to the Greeks? Where did they see it? We may imagine that, for them, the irrational could have just been a line segment, for which they could not find a numeric value that could express its relation to another line segment, that which we nowadays call the 'unit of measure'[95]. The discovery of the irrational is a fact that has been decisive in the formation of science of the Greek world and of the western world. In studying its earliest discovery, we are once again confronted with the common problem of the almost complete lack of contemporary sources on the oldest phase of history of the irrational. Sources concerning the topic date to the following period and therefore reflect the times and ways of thinking that are removed from the original situation, making it difficult to give the appropriate value and meaning to the written sources[96].

The discovery of the irrational and the use of approximations

Modern scholars have accepted the idea of Pythagorean paternity[97] of the discovery of the irrational, although they disagree on the exact definition of the period and on the circumstances that prepared it[98]. Pythagorean mathematical science consisted of different sectors, the most interesting ones to us being the theory of proportions and the true and proper geometry. Of these, the theory of proportions was particularly important, and existed independently from the theories described above. Its origin was probably not mathematical, but musical, originating in the necessity to calculate the lengths of the strings on the instrument in relation to the tones they had to produce. Within the mixed field of Pythagorean mathematics, the birth of the irrational is placed. According to Franciosi, the Greeks accidentally ran into the irrational while trying to overcome the problem of doubling

94 Ibidem, 28.
95 Franciosi 1977, 11.
96 Ibidem, 12.
97 Pythagoras of Samos was active and influential during the second half of the 6th century, leaving Samos for Egypt around 532/31 BC, founding a school in Kroton, southern Italy, and finally moving to Metapontum at an old age, where he died in 497/496 BC (Hoepfner & Schwandner. 1994, 301).
98 Heath 1921 I, 90; Franciosi 1977, 19.

the square[99]. The actual awareness of the Greeks to this particular problem is described in a famous, albeit much younger, ancient text, in passage 82b-85e of the *Meno* by Plato[100]. Here, Socrates (470-399 BC) demonstrates to a young slave how the problem of doubling a square can be solved. Using a square with sides measuring 2 units as an example, Socrates shows him that the side of the doubled square cannot be 4 units, nor 3. He then continues to point out that even if the length of the side of the doubled square cannot be determined with a number, it is possible to represent the line graphically. Apparently, at this moment in the development of Greek mathematics[101], people already knew not only that, given a geometric square, its diagonal is the side of the doubled square, but also that, if the measure of that side was associated with a number, than the diagonal could not be determined numerically[102]. It is also clear from this passage that the side of the doubled square was seen in the shape of the diagonal of the original square. That way, the impossibility of giving a numerical value to the side of the doubled square, became the impossibility of finding a pair of rational numbers that represent the side and the diagonal of a square respectively. The case of irrationality, born from the impossibility of doubling the square, thus came to present itself as the incommensurability of the side and the diagonal of the square, which are related to each other in modern terms as $1 : \sqrt{2}$[103]. The fact that there is no unit of measure that can be reduced to a rational number on the side of a square as well as on its diagonal, is also discussed by Vitruvius (*De arch.* IX, praef. 4). However, people realized at an early stage that it is possible to find a square that is 'almost' the double of an original square. We take a square with side 5 and an area of 25. Double that value is 50. If we were to take a square with side 7, its area would be 49, 'almost' double the value of the original square, less one unit. It is then accepted to say that the pair (5, 7) is an approximation of the relation of $1 : \sqrt{2}$ and to say that $5\sqrt{2} \approx 7$[104]. Similarly, series of pairs or sequences exists, that are known in the Pythagorean and late antique mathematics as arithmetic approximations of geometric proportions.

One such group is formed by the pairs of numbers that form part of the so-called sequence of Theon (Theon of Smyrna, first-second centuries AD), which expresses the arithmetic equivalent of the geometric proportion $1 : \sqrt{2} : 2$, or the side and diagonal of a square and double the side of that square. In his mathematical introduction to the works of Plato, Theon defines this sequence of $1 : \sqrt{2} : 2$ as $a : b : 2a$, whereby a and b are round numbers and, starting with $1 : 1 : 1$, each next step is defined as $(a+b) : (2a+b) : (2a+2b)$[105].

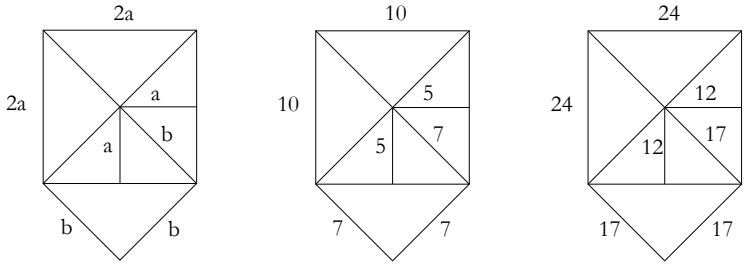
---

[99] Franciosi 1977, 20.
[100] Plato (428-347 BC) wrote this text, *Meno*, around 380 BC, more than a century after Pythagoras' teachings.
[101] At the time when Plato wrote *Meno*, so around 380 BC
[102] Franciosi 1977, 21-22.
[103] Heath 1921 I, 90-91; Franciosi 1977, 23.
[104] Frey 1990, 286.
[105] Heath 1921 I, 90-93; II, 238-244; see also Frey 1990, 282-292 and Geertman 1993, 135-136.

1	*< 2 >*	*2*
a	b	2a
1	1	1
2	3	4
5	7	10
12	17	24
29	41	58
70	99	140

And so on….

As this sequence represents the side and diagonal of a square, and double the side of that square, it can also be expressed graphically:



In the geometric reality, 1 :√2 = √2 : 2. In the sequence of Theon, the exact mean of √2 can only be approached. The sequence has two specific characteristics that are worth mentioning here. One is that the approximations become more accurate as the sequence progresses:

√2	=	1.4142…
3/2	=	1.50
7/5	=	1.40
17/12	=	1.4166
14/29	=	1.4144
99/70	=	1.4143

The second characteristic is the fact that the deviation in the approximation of side : diagonal is twice as big in the pairs of numbers on the right side of the sequence than it is in the pairs of numbers on the left side[106] (i.e. the deviation in the pair 7 : 10 is twice as big as in the pair 5 : 7). The pairs of numbers on the left side of the sequence will be called the *primary approximations*. The approximation of the geometric proportion 1 : √2 (in modern

[106] Geertman 1993, 135-136.

terms)[107] by these pairs of round numbers (5 : 7, 12 : 17, 29 : 41, 70 : 99 and so on) has a deviation of one unit. The *primary approximation* can also be expressed as a pair of round numbers X and Y, whereby two times the square value of the first number equals the square value of the second number, plus or minus 1 unit[108]:

$$2(X^2) = Y^2 \pm 1$$

For example: $2(5^2) = 7^2 \pm 1$ or $50 = 49 \pm 1$

It is therefore accepted that we have at our disposal pairs of round numbers that allow us to express the inexpressible. The existence of the series of *primary approximations* also leads to a second series of approximations, which can be derived from the primary approximations in a systematic way, based on the assumption that a square with double the side must also have double the diagonal. For example, if 17 is an acceptable approximation of the diagonal of 12, then 34 is an acceptable approximation of the diagonal of 24[109]. This second series of pairs of numbers will be called the *derived approximations*.

As mentioned, the deviation in the *primary approximations* is plus or minus one unit. In the *derived approximations*, this deviation increases to plus or minus two units. This *derived approximation* can also be expressed as a pair of round numbers, Y and 2X, whereby two times the square value of the first number equals the square value of the second number, plus or minus 2 units:

$$2(Y^2) = (2X)^2 \pm 1$$

For example: $2(7^2) = 10^2 \pm 2$ or $98 = 100 \pm 2$

Both primary and derived sequences of approximations can be expressed in relation to each other:

Primary	*Derived*
X : Y	*Y : 2X*
5 : 7	7 : 10
12 : 17	17 : 24
19 : 41	41 : 58
70 : 99	99 : 140

And so on…

It must be noted here that, despite that fact that the sequence of Theon becomes more accurate as it progresses, analyses of ancient buildings reveal that, in antique design and

---

[107] It is important to realize that for the ancient Greeks, √2 did not exist, and is only used here as a modern term. Instead, the Greeks only worked with the relation side : diagonal of a square, which could be expressed and approached by the pairs of numbers mentioned in this chapter.
[108] Frey 1990, 291.
[109] Ibidem, 291.

building practice, the more inaccurate approximations of 7/5, 10/7 and 17/12 were used most frequently.

1. RELEVANCE OF THE APPROXIMATIONS TO ANCIENT ARCHITECTURE

Besides the pairs of numbers that approximate √2, the ancients were also familiar with pairs of numbers that approximate √3 (when a square is 'almost' triple the original square) and √5 (when a square is 'almost' quintuple the original square).These pairs of numbers were always well known to modern specialists of ancient mathematics, but also occur frequently in analyses of ancient buildings. The question is: why were these pairs of numbers used in architecture? If we take, for example, the approximation of √2, this means that we would find, in a built structure, two lengths, one of which is (almost) equal to the diagonal of a square, constructed on the other length[110]. In other words, the architect has translated the geometric construction to an approximation that provides usable round numbers, allowing incommensurable quantities to be approximated by a system of arithmetical quantities[111]. In fact, we frequently find the approximation of 1 : √2 in the Pompeian atrium houses of this research; not only did the architects make use of the *primary approximations*, which would allow the most accurate expression of the geometric design, they just as easily used *derived approximations*. Furthermore, Geertman also found the use of another formula, which he only encountered in the architecture and not in any ancient treatises on mathematics. This particular approximation occurred in the dimensions of temple doors in Tivoli, Cori and the round temple at the Forum Boarium: $1 : \sqrt{2} : 2 \approx 10^2 : 12^2 : 2 \times 10^2 = 100 : 144 : 200$. The downside to this sequence is its rather high level of inaccuracy; its advantage, however, is the way in which it is just as easily applicable in the decimal as the duodecimal system of feet and thumbs that were commonly used in the construction of ancient buildings[112]. Apparently, in building practice, the ultimate goal was not to reach the purest geometric proportions and relations within a building, but to reach a total coherence within the design by introducing practical and usable pairs of numbers.

But why would an architect prefer this method of defining his measurements to another? Why opt for the construction of a square and rotating its diagonal to create a new length, when you already know that those two line segments (the side and diagonal of the square) are incommensurable? We know this was common practice through numerous studies of ancient buildings, but to ascertain this phenomenon is only useful when it can lead to an actual interpretation[113]. The above mentioned proportions are all part of the well known Pythagorean theory of means, which describes the different ways in which three entities can be related to each other: the arithmetic, the geometric and the harmonic means. According to

---

[110] Ibidem, 286.
[111] Geertman 1993, 235.
[112] Ibidem, 236-237.
[113] Frey 1990, 286.

Louis Frey, this is the theory that could form the theoretical framework that allows us to give meaning to the relations and proportions that are found in an ancient building[114].

The theory of means

We know that Pythagoras discovered the dependence of musical intervals on numerical ratios, and that the theory of means was developed very early in his school with reference to the theory of music and arithmetic. We are told that in Pythagoras' time, there were three means, the arithmetic, the geometric and the harmonic[115].

The theory of means is based on three quantities (a<b<c) that are connected by a certain relation. The different relations can be expressed as follows:

1. *The arithmetic mean*: *b* is the same amount larger than *a* as it is smaller than *c*. For example:
   a = 1, b = 2 and c = 3
2. *The geometric mean*: *a, b* and *b, c* have the same ratio, or, in modern terms:
   a : *b* = *b* : *c*.. For example:
   In numbers: a x 2 = b and b x 2 = c, so a = 1, b = 2 and c = 4
   In line segments: a x √2 = b and b x √2 = c, so a = 1, b = √2 and c = 2
3. *The harmonic mean*: *b* is a part of a larger than *a* and the same part of *c* smaller than *c*. For example:
   In numbers: b = a + 1/3a and b = c – 1/3c, so a = 3, b = 4 and c = 6
   In line segments: a = 1, b = √2 and c = 1 + √2

The differences between the three types of means can be illustrated by the following:

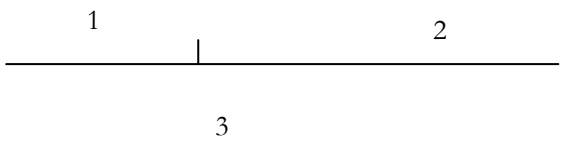
	a	b	c		a	b	c
Arithmetic mean	2	3	4	=	12	18	24
Geometric mean	1	<√2>	2	=	12	<17>	24
Harmonic mean	3	4	6	=	12	16	24

Apart from the arithmetic, geometric and harmonic means that express the relationships between three quantities, we also know of the mean division of a straight line[116], which forms a particular case, whereby the rule a + b = c is always valid. This mean division of a straight line deserves to be regarded separately here. As was already mentioned above, in ancient architecture we are mostly dealing with linear relationships. As a consequence, ancient architects, when defining both the general and the detailed dimensions of a building and all of its characteristic elements, frequently applied the mean division of a straight line.

---

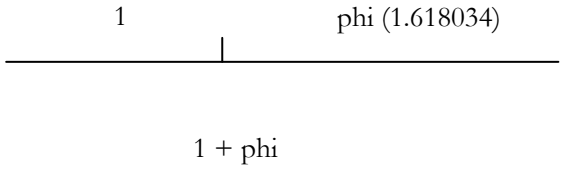
[114] Ibidem, 287.
[115] Heath 1921 I, 85; Frey 1990, 292-294; 1992, 42-45.
[116] Frey 1990, 294-299.

a. The arithmetic mean



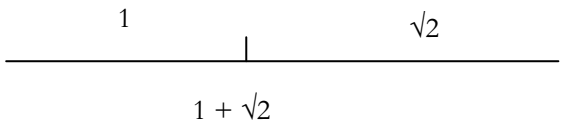
(a + c)/2 = b
a = 1, b = 2, c = 3

b. The geometric mean (in modern terms known as sectio aurea*)*



phi = (1 + √5)/2
(in modern terms)

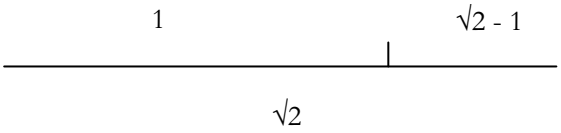
c. The harmonic mean



(b + a) : a =
a : (b – a)
a = 1, b = √2,
c = 1 + √2
(in modern terms)

The theory of means was further developed in the Pythagorean school by the gradual addition of seven others to the first three. One in particular, the so-called *sub-harmonic mean*, is also frequently found in ancient buildings and must therefore be mentioned here[117].

d. *The sub-harmonic mean*



$a^2 + c^2/a + c = b$
a = 1, b = √2 – 1,
c =√2

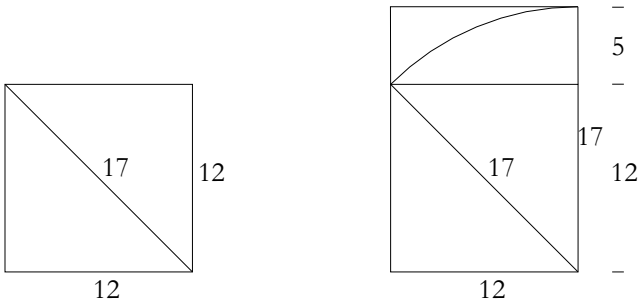
Together with the harmonic mean of a straight line, the sub-harmonic mean is the most frequently applied mean in antique architecture. This is contrary to popular opinion, which is often preoccupied with the presence of the geometric mean, in modern terms known as the *sectio aurea*, in ancient buildings.

[117] Heath 1921 I, 86-88; Frey 1990, 299-300.

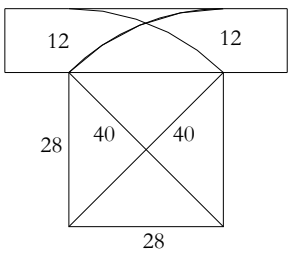
1. RELEVANCE OF MEANS TO ANCIENT ARCHITECTURE

As Frey mentions, the sub-harmonic division of a straight line is often used in antique architecture to define rectangles that contain for example a colonnade or a door or any decorative element[118]. With the following two illustrations, the sub-harmonic division based on the pair 12/17 will be demonstrated.

We start with a square with a side 12 and draw its diagonal, which measures 17 (fig. 1). The pair 12 : 17 is an approximation of the geometric relation between the side and diagonal of 1 : √2. The diagonal 17 is then rotated to form a new rectangle with a width 12 and length 17 (fig. 2). This type of rectangle (in this case measuring 12 x 17) is also known as a sub-harmonic rectangle[119], and the longer side is divided as a sub-harmonic mean, whereby a = 12, b = 5 (12√2 – 12) and c = 17 (12√2).



The sub-harmonic rectangle is frequently used in the atrium houses analysed in this research, in particular in the design of the atrium space. Not only do we see the sub-harmonic rectangle in these houses, we actually also find the sub-harmonic division of a straight line as described above, in the division of the length of the atrium into a closed wall (with doors to the cubicula behind) and the ala opening. For example, the measures of an atrium may be 28' x 40' (approximation 7/10), whereby the atrium length of 40' is divided into a closed wall of 28', followed by an ala opening of 12'. The relation between these measures represents the sub-harmonic division of a straight line: 12' : 28' : 40' = √2 – 1 : 1 : √2.



[118] Frey 1990, 300-301.
[119] Ibidem, 300.

Vitruvius' prescriptions and the reality of antique architecture

With this short discourse on the early history of mathematics, the discovery of the irrational and the theories of means and proportions, we have created the theoretical framework, within which we can interpret the relations and proportions that we find between the different elements of an ancient building. It seems justified to accept that, in a world where the general intellectual climate was one of a preoccupation with numbers and proportions and where the 'irrational' had become an accepted phenomenon in the ways of thinking and expressing, the trade of architecture too was subject to the development of its time. However, even though numerous analyses of ancient Greek and Roman buildings have revealed the presence of geometric patterns, expressed in arithmetic approximations, there are still modern scholars that remain sceptical. For a large part, their scepticism is caused by the only surviving manual on ancient architecture, Vitruvius' *De architectura*. The problem lies mostly in the way that Vitruvius presents his material to his audience. Rather than offering a complete description of the design concepts that he discusses, he provides his audience with rather haphazard descriptions of small parts of that total concept. For instance when he does not give a general description of the façade of a certain type of temple, but instead spreads his prescriptions on the circumference of a column over several places in chapter III, then continues with the prescriptions for the height of the column, for the capital in another place still, and finally for the entablature. In order to recreate the whole picture of the temple façade, the reader needs to extract different bits of information from different places in the text[120]. As Geertman warns us, interpretations of Vitruvius' prescriptions that are only concerned with the text of those prescriptions, are not only fruitless, due to the incompleteness of Vitruvius' data, they are in fact dangerous, as they lack any external testing. In order to reach conclusions on the nature and the extent of Vitruvius' relationship with the actual built architecture, we cannot solely focus on Vitruvius' working method and the characteristics of his system, but must also look at the design practice of his peers and predecessors. The fact that a direct comparison of Vitruvius' prescriptions to the built architecture leads to problems, is again caused by the way in which Vitruvius selects and presents his subject matter. In many cases, his prescriptions for the dimensions of certain objects, are presented as simple ratios, such as 5 : 7 for the ratio between the height of a door and the height of the wall within which the door is placed. The fact that these numbers form part of a collection of approximations that represent geometric concepts, is only clear through comparison with the actual architecture. Apparently, Vitruvius is mostly concerned with concrete prescriptions and not with the underlying systems and their connection. As a result of this attitude, many of Vitruvius' numbers do not have any structural meaning and are really nothing more than the arithmetic consequence of his choice for a certain model, which in itself is not discussed. The geometric-arithmetic model is thus brought back to no

[120] Frey 1990, 287.

more than a series of technical prescriptions. The fact that he does not specifically discuss the geometric and arithmetic systems and the ways in which they can be applied, is typical of Vitruvius' working method[121]. The question that remains is: why does Vitruvius choose this particular way of presenting the architectural method of design? One decisive factor that Vitruvius himself mentions, is his wish to comply with the needs of his audience[122]. *De architectura* cannot be seen as a manual such as we know it, written for professional architects and engineers, as it lacks the detail of information that would be essential for such a treatise. On the other hand, we need to realize that Vitruvius' prescriptions and rules do hold important information for those who already have a certain degree of knowledge on this particular subject matter, to which they can easily refer. In the case of *De architectura*, the information is specific, extensive and diverse enough that it may have functioned as an encyclopaedia for whoever had an active or passive interest in the art of building and engineering. It is only by working from the premise of such a mixed audience, whether interested, studying or professional, that the selection and presentation by Vitruvius can be explained[123].

So how should we interpret what we read in *De architectura*? We have two types of evidence on the methods used in ancient architecture: a text and the buildings. Even though there is no conformity between those two in regard to the value of the dimensions, there is conformity in the way in which those dimensions are determined. Both the text and the buildings can be interpreted in a general framework of applying divisions and approximations, the only difference being how they use and organize them. In order to explain the seemingly insuperable differences between the text and the real architecture, Frey draws an analogy between a musician and an architect. He thereby compares the way in which a musician makes his own choice of the method he uses for his composition, making use of the different intervals between the tones of a gamma, to the way that an architect composes a building according to a certain rhythm, giving preference to certain proportions. According to Frey, what Vitruvius offers us is just one of the possible melodies, that form the textual evidence of the existence of those gamma's that others used, who played their own, different melody. If we accept this analogy, we cannot blame Vitruvius for describing buildings that we do not find in reality[124].

Even though studies that compare Vitruvius' writings to the reality of ancient architecture, have revealed that there are at least as many dissimilarities as there are similarities, we cannot interpret Vitruvius' numbers as solely the product of a theorist and regard Vitruvius himself as a man removed from the building practice of his day and age. Analysis of antique architecture reveals that the system of design that forms the background to Vitruvius' writings, is but one alternative within a wider tradition that also includes the

---

121 Geertman 1993, 242-244.
122 *De architectura* V, praef. 3.
123 Geertman 1993, 244.
124 Frey 1990, 328.

actual ancient buildings. Vitruvius' treatise consists of his own selections, preferences and discussions on matters of design practice and tradition that existed within his profession. *De architectura* can be regarded as a work reflecting the real state of affairs, a general image that had already existed for many generations of architects. This view is actually partly confirmed by Vitruvius himself when he writes about Greek architects dating back to the fourth century BC, as well as his own teachers and the training within this tradition[125]. It is within this long-standing architectural tradition that the atrium houses of Pompeii can also be placed. Regarding Vitruvius' relation to the reality of architecture, previous research has led to some general conclusions[126]:

1. The general statements and concrete prescriptions presented by Vitruvius are a personal selection of his perception of contemporary reality.
2. Vitruvius' prescriptions on proportional designs and relations stem from a general system that was common good for professional architects of his own time and of previous generations.
3. Vitruvius' statements must be read as the symptoms of that system. They are no more or less than variants within that system, just as different building projects are variants of real architecture in building practice.
4. The antique building practice made a conscious use of the different possibilities offered by ancient mathematics and the developments that took place within it. The systematic use of geometric concepts – figures as well as proportions – and of their arithmetic approximations, was a significant characteristic of Hellenistic and late Republican architectural design.

The process of design

Reconstructing the design patterns that are embedded in the shape of the ancient buildings that we study, really means trying to understand the design process that an architect had to complete each time he was commissioned to construct a building[127]. This design process runs from the initial conception of a plan and build-up to the final construction of a building, with a 'grey' area, consisting of all kinds of choices, adaptations and alterations, in between. As Mark Wilson-Jones puts it: "Design is a process, a dynamic interaction between concept and contingency, between the generic and specific; it evolves progressively as multiple individual decisions are assimilated into the whole[128]." In that time zone between the architect's first conception and the final construction, which is much less tangible and understandable than the final constructed building, all kinds of influences can play a role and alter the course of the design process. Some of those changes may be deliberate, but others

---

[125] *De architectura VII*, praef.10-18
[126] Geertman 1993, 244; 1997, 22.
[127] Rakob 1974, 76-77; Geertman 1989, 156.
[128] Wilson-Jones 2000, 49.

result in the building not turning out as it was originally intended. Unwanted results can be caused by a variety of factors, such as inaccuracy of the builders, a change of mind of the client, a mistake by the architect himself, or some other, unforeseen circumstance, such as political instability or problems of material supply[129]. This phase of different influences on the design process poses difficulties in the attempt to reconstruct the original design, for we can only study the end-result, which has inevitably been affected by the modifications that are inherent to the design process. The biggest danger in this type of analysis is to attach too much value to individual measures and proportions, for example because they form neat, round numbers or simple, rational proportions. The only way to value their meaning is to understand the underlying design patterns that join all the different relations and proportions between the measures of a building in one design system[130]. Once this system is recognized, we can also recognize where certain parts of a design were altered during the design process and try to explain the reason for their change. Without an analysis of the coherence between the different measures of a building, any comments on the original design are meaningless.

1. GEOMETRICAL CONCEPTS AND THE SYSTEM OF APPROXIMATIONS

The analysis of a considerable number of ancient public and private structures has led some scholars[131] to conclude that antique architects frequently applied geometric concepts in their designs. Friedrich Rakob was the first to emphasize repeatedly that Roman building practice was based on the principle of geometric design. To his opinion, the geometric concept that forms the base of a design, should not be regarded as an ingenious theoretical system of proportions of a mathematical or philosophical-esthetical nature, but rather as a practical tool aimed at the demands of the construction site. He also proposes several methodological premises for the recognition of the original design as it was realized at the building site. These premises are: the researcher has to recognize the principal points and lines of the layout of a building; those points and lines have to represent a clear and straightforward geometric system, and their metric values can be converted to round numbers of (Roman) feet[132]. Recognizing the fundamental importance of Rakob's reflections, Geertman expresses some concerns regarding his methodological premises. Firstly, Geertman feels that we cannot regard the geometric concept purely as a simple tool for the work at the construction site. He refers to Vitruvius (I, 2, 2), who tells us that the first function of the geometric design was to articulate spaces, volumes and vertical planes, in other words, the regulation of the ground plan and build-up in one coherent system. On the one hand, working with a geometric design means applying mathematical figures such as circles, rectangles and polygons. On the other hand, it implies working with a module that constitutes these figures. The module is principally a geometric base value that coincides with

---

[129] Ibidem, 11.
[130] Rakob 1974, 76-77; Geertman 1989, 156.
[131] See Rakob 1974; Frey 1990, 1993; Geertman 1984, 1989, 1993, 1997; Van Krimpen-Winckel 2006.
[132] Rakob 1974, 76-77.

or is derived from a given measure, such as a width, diagonal or diameter. Often, the module is linked to a characteristic architectonic feature such as a column. Whether or not this module is a round number depends on the geometric figure that was used as starting-point. With this in mind, we must reject Rakob's premises regarding the presence of round numbers for the correct reconstruction of the geometric design. The arithmetic formulas that we find are the expressions of the geometric values of the design, nothing more and nothing less. They can produce round numbers, but not as a rule. In some cases in fact, round numbers are produced by coincidence and, when interpreted wrongly, can be highly misleading by their presence[133].

Although the use of geometric concepts in antique architecture is generally accepted, the use of arithmetic approximations, both on a theoretical level and on the level of trade, is much less noted. As was explained above, the approximation may come close to the original geometric value, but it will never be exact. Despite this inaccuracy, its attractive nature is defined by the fact that it has the ability to change those geometrical quantities that are in fact incommensurable into quantities that are commensurable and therefore usable within the arithmetic system[134]. However, the function of approximations in antique architecture was not only that of arithmetic surrogates of geometric constructions. We are dealing with an independent phenomenon with its own set of advantages and applications. Its highly flexible nature in particular made it suitable for application in architectural designs. Not everybody shares this opinion, and criticism on the recognition by some scholars of the use of the geometric design and approximations, still remains[135]. Part of this criticism is caused by the presentation by Vitruvius of his subject matter and part of it is caused by the idea that, if we accept all the different types of approximations that were described above[136] to express a geometric construction, than there are not many pairs of numbers that could not be interpreted in terms of geometric concepts. In other words, researchers that believe in the use of geometric concepts and approximations read too much into the pairs of numbers they find, forcing them into a geometric system, while all they really are is simple rational proportions. The fact that, by accepting these different approximations, most pairs of numbers could be interpreted in terms of geometric concepts, is true. But only if we consider them isolated from their context, and consequently isolated from the relationships that they also have with the other dimensions of the studied object. An individual proportional relationship, taken on its own, has no meaning. An understanding of how the individual measures of a building are mutually coordinated can only be reached by a reconstruction of the so-called regulatory design, the geometric construction based on a modular unity[137]. By

---

133 Geertman 1989, 156; 1993, 212.
134 Geertman 1993, 235.
135 For example Pierre Gros (1976), who states that Vitruvius was unfamiliar with geometry and only knew her as a technical tool for the modelling of certain objects.
136 Approximations of the first, second and third order, as well as other types such as the $10^2 : 12^2$ approximation.
137 Frey 1993, 45-46.

(re)constructing the underlying patterns that form the 'framework' of the design, the pairs of numbers can be interpreted within their appropriate context and their meaning understood. Regarded in this light, the criticism of scholars such as Gros, is actually based on a view that lacks criticism itself, as it focuses on individual numbers instead of on the system.

2. INTERPRETING ANTIQUE ARCHITECTURE: ANCIENT METHOD VERSUS MODERN ANALYSIS

"If there is a square area, or field with equal sides, and it is necessary to double it, there will be required some number which cannot be found by multiplication, and correct straight lines bring us to the solution" (*De arch.* IX, praef. 4). In his conclusions of his study of the means and approximations in Vitruvius, Frey concludes that the opposite was true in ancient design practice. He states: "On the contrary, we can now establish the following: 'this can only be done by using numbers, and without making use of straight lines'"[138]. To Frey's opinion, this is exactly what Vitruvius himself does, perhaps without even knowing it, in any case without saying it. Indeed, the numbers that he gives us are justified by and have their meaning in the lines that he does not draw. Frey continues by saying that Vitruvius is right in presenting his material in this manner, because to design a building, one does not require any geometric constructions. One can suffice with:

1. Having some notion of means.
2. Disposing of a table that gives lists of pairs of numbers, indicating how to divide a straight line in a certain proportion.

To give some simple examples: if one wanted to divide a length of 12 units harmonically, the table would say: divide 12 into 7 and 5; and for a geometric division of 21: divide 21 into 13 and 8.

The geometric construction is the geometrician's tool, when he is trying to demonstrate something in particular. The architect does not want to give a demonstration, he is constructing a building. Therefore, he has no need to draw the figures from Euclides' *Elements* or any other manual. It would be pointless for an architect to go through the trouble of creating squares or doubles squares and then rotate parts of the diagonal. His only concern is to juggle the relations and proportions into a coherent picture.

The geometric construction is not only the geometrician's business, however; it also concerns us. For us, it forms a method of analysis, which has the ability to show us the mutual coherence between the different relationships. The geometric construction allows us to understand how those different relations and proportions are derived from what we call the modular unity. Conversely, these geometric designs or regulatory schedules that we reconstruct, may never have been designed by the antique architect, at least not in the way that we portray them. Their value lies in their potential to reveal to us the coherence between the different dimensions of a building. Even if the particular form of the analytical

---

[138] Frey 1990, 325.

instrument does not allow to reconstruct its use during the initial conception of a building, it does clarify to us the intention of its designer and allows us to form some hypotheses concerning his plan[139].

In conclusion we can say that, in antique architecture, it was all about proportional relations. Although this topic is not of great significance in present-day mathematics, it played a major role in ancient times. When studying ancient building practice, we are mostly dealing with certain models, which were expressed as and translated into pairs or sequences of numbers. From the sixth century BC onwards, the Greek intellectual world underwent some radical changes, as the abstract way of thinking and expressing became accepted. This had a major impact on all the different sciences of the time, which were still developing their theories. For example, in mathematics, Pythagoras and his followers discovered the irrational. As a science of its time, architecture too must have been influenced by these developments, and the geometric design, expressed in series of arithmetic approximations, became a much-used method. The fact that it was so successful must have been a consequence of the peculiarities of the geometric system and the advantages of the use of approximations alongside and as a support of that system. This particular combination provided the architect with a powerful and complete design tool, which functioned both as a 'drawing table' and as a 'calculator'.

[139] Frey 1990, 326-328.

CHAPTER IV

THE ATRIUM HOUSE IN HISTORICAL PERSPECTIVE

Introduction

This chapter deals with the atrium house as a particular house type indigenous to the Italian peninsula, and its development through time. For, despite the overwhelming amount of evidence of atrium houses, widespread both chronologically and geographically, the matter of its development still remains at least partly unsolved. We will focus on the question which elements exactly make up an atrium house, as we have for too long been led solely by the reading of Vitruvius' descriptions which were used to 'explain' the evidence of the Vesuvian sites[140]. Recent studies have revealed that by focussing almost solely on the Vitruvian compluvium-impluvium arrangement, researchers have often denied the connection between some very early examples of courtyard houses and the Pompeian houses. This matter has been brought to light in a particularly clear and profound manner by Andrew Wallace-Hadrill in his article 'Rethinking the Roman Atrium House'[141], which will be used as the basis for the discussion presented below.

The development of the atrium house: traditional views[142]

1. THE ORIGINAL 'ATRIUM HOUSE' FORM: OPEN OR CLOSED?

As was mentioned briefly above, prior to investigating the origins and development of the atrium house, we need to define what we consider to be the characteristic elements that make up this specific type of house. Chapter II already discussed the scholarly tradition of using a combination of the archaeological evidence from the Vesuvian cities and the written evidence from ancient texts, specifically Vitruvius, to create the 'ideal Roman house'. This theoretical ideal house form was then used as the basis for the creation of an evolutionary account of the development of the Roman house[143]. The main characteristic of this idealized house type is the arrangement of the principal rooms of the house around a central space.

---

[140] On the dangers of the analogical interpretation of the atrium (-peristyle) houses by the use of Vitruvius' prescriptions see Allison 2001, 189-192.
[141] Wallace-Hadrill 1997, 219-240.
[142] The term 'atrium house' will be used by the author to describe the type of house that we are accustomed to give this name in modern literature. It is not the author's intention to give particular meaning to the term atrium, nor to consider the Pompeian houses as the ideal example of this house type and compare other houses to them in order to determine whether or not they belong to the same type. The discussion in this chapter will make clear that there is no such thing as 'the atrium house', but rather a group of houses that share similar elements in their architectural build-up. Until we have come up with a better term to describe these houses, I feel obliged to use the term that is best known and understood.
[143] For an overview of the standard accounts based on this 'Roman house' see Wallace-Hadrill 1997, 219, note 2.

The rooms that were considered most important are the entrance (fauces or vestibulum), the alae (wings) to the right and left of the atrium, and the tablinum, positioned centrally at the back (Fig. 8).

The roof over the central area was left open in the middle for the collection of rainwater in a corresponding basin in the floor: the compluvium-impluvium arrangement[144]. The presence of this arrangement has always been of major importance in the identification of the 'traditional atrium house' by modern scholars; so much so, that houses that are similar in build-up but lack this particular roof structure are dismissed from this category and the term atrium is only applied to houses with the compluvium-impluvium arrangement. Furthermore, the idea of an open court as the central area of these townhouses was unthinkable, and wherever evidence of an impluvium was lacking, the only other option considered was that of a completely closed roof, described by Vitruvius as an *atrium testitudinatum* (VI 3, 2).

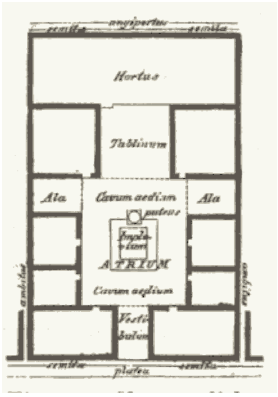


Figure 8: Original plan of the atrium house (Overbeck and Mau 1884, 248)

Wallace-Hadrill[145] presents one of the most remarkable examples of this scholarly discussion: the Casa del Chirurgo (VI 1, 10) in Pompeii. This house was for a long time considered as the oldest known traditional atrium house, with its suggested construction date as early as the fourth or even fifth century BC. The building materials and techniques used in the construction of this house (Sarno limestone *opus quadratum* and *opus africanum*) were, and still are by many, considered to be indicative of an early building date. Regarding the Casa del Chirurgo, but also many other houses within Pompeii, Fiorelli observed a problem: all of these 'early' houses had impluvium basins constructed in Nocera tuff, a building material that was considered to be indicative of second century BC construction. Fiorelli subsequently proposed that the earliest houses in Pompeii were originally constructed without an impluvium and therefore had no roof opening[146]. This idea was then rejected by Nissen, who concluded that the use of tuff for the impluvia was a practical choice based on the properties of the stone and had nothing to do with subsequent building phases. Tuff is a relatively soft type of stone, whereas limestone is too hard to cut smoothly and too porous to make a good basin lining[147]. When Maiuri was appointed soprintendente of Pompeii in 1926, he decided to do some stratigraphic testing in the Casa del Chirurgo in order to establish who was right[148]. His excavations revealed that the atrium had two distinct floor levels, the first some 30 cm underneath the level of AD 79. The earlier level consisted of a beaten earth floor and revealed no traces of an impluvium basin, supporting Fiorelli's view of the impluvium as a

[144] Vitruvius mentions four different types of atria with a compluvium-impluvium arrangement, depending on the construction of the roof: Tuscan, Corinthian, tetrastyle and vaulted (*De arch.* VI 3, 1-2)
[145] Wallace-Hadrill 1997, 223-226.
[146] Fiorelli 1873, XII and 84.
[147] Nissen 1877, 38.
[148] Maiuri 1973, 1-13.

later insertion. As regards the original form of the atrium, Maiuri proposed that it was like the courtyard of a country house. In his final conclusion, however, he asked whether the first phase of the atrium should be considered compluviate or displuviate, and with that, the idea of an open court was completely lost. However, the fact that the open courtyard was in fact Maiuri's solution becomes clear when he does another series of stratigraphic excavations in some of Pompeii's atrium houses, particularly during the war years[149]. In three of these houses, Maiuri also found evidence for layers of beaten earth floors underneath the impluvia of the houses as they existed in AD 79, with no traces of an earlier impluvium. Maiuri's writings of the time make it clear that he regards the atrium houses as being derived from farmyards and later than the Etruscan period[150]. Maiuri was by this time convinced that the compluviate atrium is a secondary phase in an atrium arrangement that was originally based on an open courtyard. This idea of an open atrium was, however, not picked up by Maiuri's colleagues and remained largely ignored in the field of research of atrium houses. For example, both Eschebach[151], who reconstructs the earliest phase of the atrium of the Casa di Ganimede (VII 13, 4) as testudinate and Laidlaw[152], who noted that the Casa di Sallustio originally lacked an impluvium and was thus testitudinate, both ignore the possibility of an open space.

The apparent conviction that central spaces in town houses must have been either completely or partially roofed-over was not just applied to the reconstruction of atrium houses in Pompeii. A similar reconstruction of a closed roof was made by Hoffman for the row houses (terraced houses/*case a schiera/ Reihenhäuser*) in Regio I insula 11[153]. He identified these houses as built in series on standard patterns and based on a different architectural conception than atrium houses. Reconstructing the insula with a central dividing line with the houses set back to back, exploiting the street frontages on each of the long sides, he believed that they had two floors, the upper storey being identical in build-up to the ground floor, and that the central space was roofed over, even though he admits that there are no clear traces. Hoffman's reconstruction was widely accepted and became the textbook example of this type of 'middle class' housing. However, recent work in the insulae of the SE quarter of the city by Nappo and his team has allowed a significant revision of Hoffman's picture[154]. It is now clear that the original houses stretched the full width of the insula with a garden-area at the back, that they were constructed around an open courtyard and that they were built on one level only[155]. Nappo recognizes four different types of row house and concludes that in their earliest phase, these houses were fairly simple and modest. Rainwater was collected

---

149 Three of these houses also form part of this research: the Casa del Chirurgo (VI 1, 10), the Casa del Gallo (VIII 5, 2-5) and the Casa della Calce (VIII 5, 28).
150 Maiuri 1946. Lezioni sulla casa romana e pompeiana, Naples. A copy of this privately distributed publication is present in the library of the Soprintendenza di Pompei. See Wallace-Hadrill 1997, 226.
151 Eschebach 1982, 258-63, 306-7.
152 Laidlaw 1993, 217-33.
153 Hoffman 1984, in *Pompei 79*.
154 Nappo 1997, 91-120; Wallace-Hadrill 1997, 221-222.
155 Nappo 1997, 100.

from the roofs and led into cisterns for domestic use and the cultivation of a small garden at the back. Hoffman's reconstruction of these houses with two storeys seems to apply only to the later stages of development[156].

The persisting focus on the presence of some kind of roof over Italic town houses, and atrium houses in particular, may stand in our way to understanding their development. The idea of an open, unroofed, courtyard as the centre of the Roman house deserves more attention than it has been given in the past. Instead, we may want to put more emphasis on the architectural build-up of these houses, the arrangement of spaces in relation to each other. In particular the succession of rooms in the depth of the house (front room-central space-back room) and the gathering of rooms of different sizes around a central court, roofed or unroofed[157].

2. EARLY 'ATRIUM HOUSES' IN THE ITALIAN PENINSULA

Following his excavations in the atrium houses of Pompeii, Maiuri concluded that they signify the end and not the beginning of a long period of development of private buildings in Pompeii[158]. This development was clearly not confined to the city of Pompeii alone, but formed part of a long and widespread tradition of house building in the Italian peninsula. The origins of the atrium house remain to this day unclear, and research of Italic housing often appears preoccupied with either proving or denying the link between the earliest examples, dating back to the sixth century BC, and the material evidence from the Vesuvian sites. Some of the most important excavations in this field and the excavators' interpretations of the finds will be presented here and discussed in reverse chronological order.

ROSELLE

One of the earliest known examples of a reconstructed 'true' atrium house was found in the remains of a house in the Etruscan town of Roselle, north of Grosseto on the Etrurian east coast. Based on ceramic finds, this house has been dated to the sixth century BC. The excavation of this site was directed by the Soprintendenza Fiorentina with Luigi Donati appointed as director of the excavation of the so-called House of the Impluvium, situated on the north hill of the site. According to Donati, the reconstruction of the building posed no serious problems, due to the

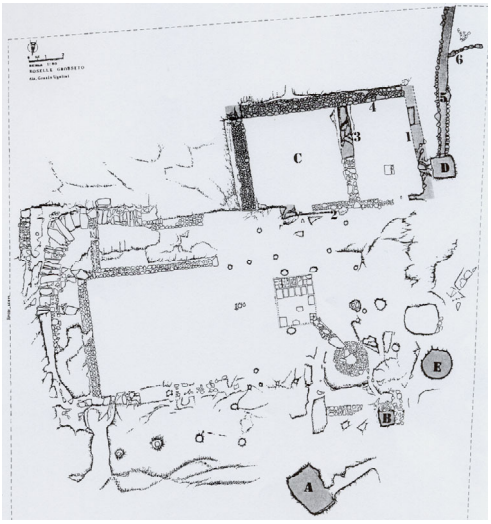


Figure 9. Roselle, excavation plan (Donati 1994, fig. 2)

156 Ibidem, 117-118.
157 Wallace-Hadrill 1997, 219-240; Gros 2001, 32-33.
158 Maiuri 1973, 182.

present remains of the walls and foundation cuts in the rock (Fig. 9).

Also, the presence of parts of the house constructed with wood or other perishable materials was almost always easily recognisable by the incisions, the postholes or other indications that were visible in the terrain. It is clear that the house was constructed on one level only, as was normal for houses in this period. The presence of a second floor is excluded because the walls could not have supported its weight and there are no traces of supportive poles that would have been necessary in the larger rooms. According to Donati, the roof structure above the central space was constructed in such a way as to create a compluvium, whereby the parts forming the compluvium where supported by architraves, which in turn were resting on poles[159].

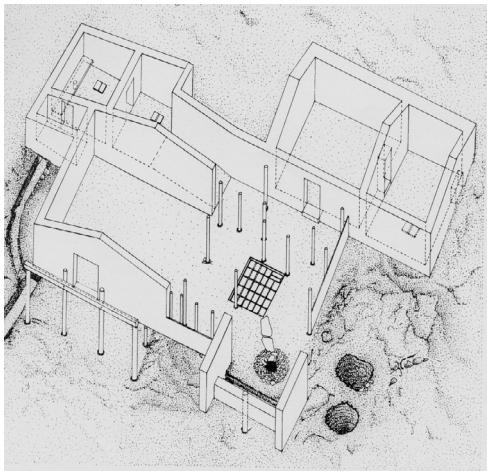


Figure 10. Restored elevation of the House of the Impluvium (Donati 1994, fig. 38)

Based on the presence of the reconstructed compluvium-impluvium system, Donati claims that one can easily identify the central space as an atrium, the feature that characterizes the Italic and Roman house[160] (Figs. 10 and 11).

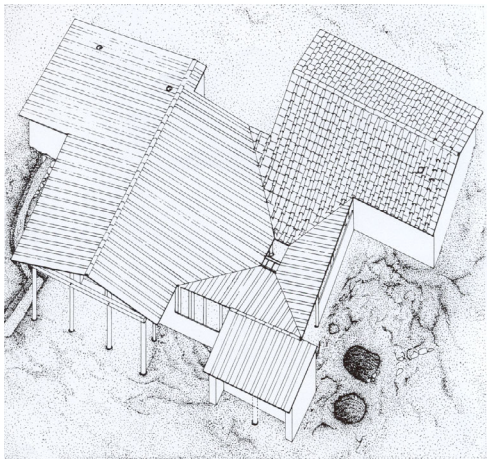


Figure 11. Reconstruction of the House of the Impluvium (Donati 1994, fig. 37)

The interpretation of the remains in Roselle as a 'true' atrium house is of great consequence as it takes up an important place in the architectural history of Italic housing, being one of the oldest known examples of this house type. However, Donati's interpretation is criticised by Gros, who points out that the supporting posts for the compluvium construction in the roof were, based in the evidence of the post holes in the central space, positioned in a disorganized manner regarding the constructive demands and were also too many (17) in number. These two arguments mean that we cannot exclude that they belong to different phases of the building. It is therefore impossible to dismiss the idea that the impluvium basin was situated in the centre of an open, unroofed space, especially since the decentralised position of the well in relation to the cistern next to the impluvium seems to indicate that it was placed there so that it could be covered, as if the rest of the courtyard was open[161].

---

159 Donati 1994, 91.
160 Ibidem, 98.
161 Gros 2001, 35.

MARZABOTTO

Similar problems occur with the interpretation of the remains of houses in another Etruscan colony, the town of Marzabotto near Bologna, dating to the fifth century BC. Originally, the results of the excavations in the early 20th century, which failed to produce plans resembling the ideal atrium house, led Patroni to the conclusion that the atrium house, which he believed to be Etruscan in origin, must have been typical of the country side rather than the city[162]. However, this idea changed with the following publication of the excavation of a block of houses[163] (Fig. 12). Two of these show a similar cruciform ground plan with a deep entrance, a sort of extremely long fauces, leading into a central space with a room on the other side that resembles a tablinum in both size and shape.

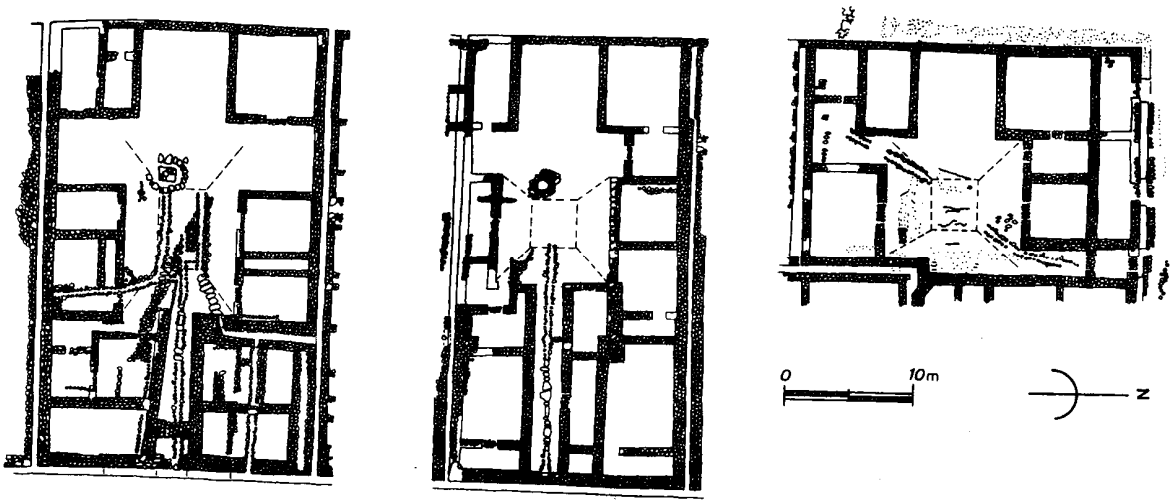


Figure 12. Plan of three atrium houses at Marzabotto (Gros 2001, fig. 16 (after Colonna))

The lack of an impluvium basin and the particular drainage system indicates that the central court of these houses was unroofed. This fact alone led a number of scholars to dismiss any connection between the houses of Marzabotto and the Pompeian atrium houses[164]. More recently, Colonna has used the finds of roof-tiles cut for inward-sloping corners to reconstruct compluviate roofs for the Marzabotto houses; he thereby contradicts the original interpretation and defines a close relationship with the oldest Pompeian houses[165]. His argument, however, is not convincing, as these particular roof-tiles may just as well have been used for an inward-sloping roof around an open court, providing sheltered walkways. In fact, the evidence of the drainage system is more suitable for an open courtyard[166].

---

[162] Patroni 1941, 296-97.
[163] Mansuelli 1963, 44-62.
[164] For example De Albentiis 1990, 70 and 72.
[165] Colonna 1986, 466.
[166] Wallace-Hadrill 1997, 234; Gros 2001, 33.

THE FOOT OF THE PALATINE

A third excavation revealing traces of supposedly grand atrium houses that is considered of major importance in the architectural history of Italic housing, is that of Carandini and his team at the foot of the Palatine hill in Rome. The results of this excavation were first presented in the exhibition on early Rome 'La grande Roma dei Tarquini' and again later in the exhibition 'Romolo e Remo'[167]. During the second half of the sixth century BC (550-520 B.C, the period of the last two kings), the area investigated, between the Arch of Titus and the Regia, was apparently subdivided into two blocks occupied by four houses[168] (Fig. 13). The material remains of these houses consisted of wall structures, floors and sewers. They continued to be in use in roughly the same form for a long period of time, ending with the sack of Rome by the Gauls in the early fourth century BC. According to Carandini, the plan of the house that is best preserved (nr. 6) is relatively certain, at least in its essential lines[169] (Fig. 14). The reconstructed house, with a total surface of 813 m², was entered through a fauces, flanked on both sides by two shops opening onto the Via Sacra. From the fauces one entered the front part of the atrium, which may have been lined with benches, such as are present in some Etruscan tombs. The central area of the atrium is reconstructed with a compluviate roof and a hypothesized impluvium. From the centre, a drainage pipe leads to the cistern with a wellhead, situated in the far right corner of the central area of the atrium. According to Carandini, we are dealing here with a primitive type of atrium with impluvium, possibly invented two generations earlier in the private quarters around the forum and rather different from the canonical Tuscan atrium, which was an invention of the early or middle Republican period. To the right and left, the central part of the atrium was flanked by an ala, and the back is completely open to a large tablinum. At the back of the property, a division is made between a masculine area (on the left side) and a

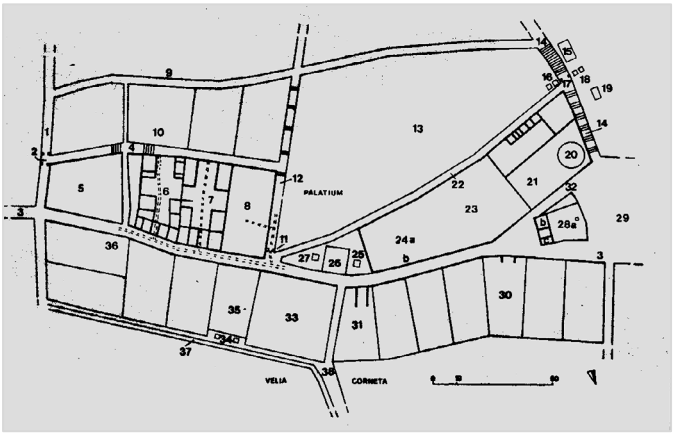


Figure 13. Plan of residential units of the 6th century BC between the Velia and the Palatine (Carandini 1990, 97)

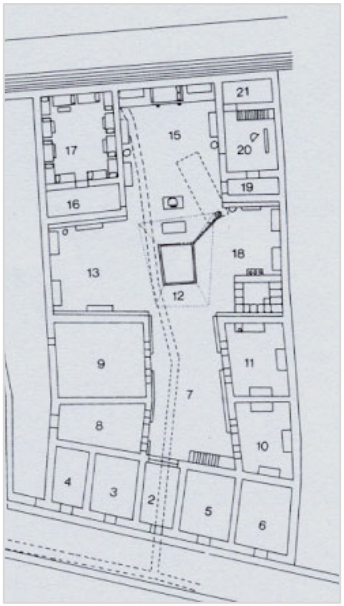


Figure 14. Plan of domus nr. 6 (Carandini 1990, 98)

[167] Moormann 2001, 210.
[168] Carandini, in: Cristofani (ed.) 1990, 97.
[169] The following description is based on Carandini's reconstruction of house 6 as presented in Cristofani (ed) 1990, 97-99.

feminine area (on the right side). A second floor is reconstructed over the front of the house, as well as above the rooms in the far right corner of the property.

Again, as was the case with the claimed discoveries of the early examples of traditional atrium houses in the Etruscan colonies of Roselle and Marzabotto, this series of grand houses at the foot of the Palatine hill is of major importance in the architectural history of the Italic/Roman house. Not only do these houses represent the only known examples of atrium houses in Rome at such an early date, they also represent a certain level of society for which there is no other clear evidence. However, Moormann questions Carandini's certainty of their reconstruction as 'true atrium houses' with a compluvium-impluvium arrangement[170]. He criticises Carandini's use of ancient sources, who literally follows the chronology of the seven kings as the foundation of his own time scheme and lists details of descriptions of events for his reconstructions, such as the presence of the hypothesized second floor on the excavated houses. Furthermore, Carandini assumes that these houses were actually occupied by the last of the kings of Rome and gives them the same form and function as the examples we know from Pompeii, dating from the third to the first centuries BC. Moormann rightly points out that Carandini thus supposes that the kings of the sixth century BC lived and worked in these houses in the same way that the magistrates of the late republic did. As far as the archaeological evidence itself is concerned, there is barely any evidence for the reconstruction of the internal walls, floors and sewers. We cannot even be sure that the remains all belong to the same phase[171]. Furthermore, the finds of objects within the houses are minimal and the reconstruction of the interior arrangements and decoration is completely based on the evidence from Etruscan tombs, some of which have a central space that resembles an atrium, combined with the evidence from textual sources. However, no examples of this type of tombs are known from the city of Rome, at least not from the period of the Tarquinii[172]. In fact, Carandini's reconstruction of the material remains as atrium houses, despite the fact that no other atrium houses are known from Rome in this early period, is based on an assumption that they must have existed because of the large dimensions of the houses found during this excavation. Moormann, however, judges this conclusion to be more or less groundless[173].

---

[170] Moormann 2001, 209-212.
[171] Ibidem, 210.
[172] Contra Gros, who agrees with Carandini that the comparison with Etruscan tombs is useful, allowing us to better understand the organisation of the houses, as well as the decoration of this type of house (2001, 37).
[173] Ibidem, 211; contra Gros who states that the cruciform space in the centre of house 6 can without doubt be interpreted as one of the earliest versions of the archaic atrium (2001, 36).

COSA

From these very early examples of 'atrium houses' in the Italian peninsula, we take a step forward in history to the Roman colony of Cosa. Founded in 273 BC, it is positioned about 130 km north of Rome. The State University of New York (SUNY) undertook excavations here in 1968 and 1969. In the part of the city block they excavated, the remains were found of a large house, referred to as the SUNY house or the House of the Skeleton, dating to the early first century BC, the period of the colony's greatest prosperity[174] (Figs. 15 and 16). The house[175] was entered by the fauces (22), which offered a view through the court (19) and into the tablinum (13). Upon entering the court, the visitor's glance is drawn to the right into an ala (16), which was completely open to the court. From the tablinum, a narrow doorway in the far right corner leads into a richly decorated space (11). Originally, the back wall of the house was in line with door openings 15-13 and 13-11, so that the overall plan was a square. In a later phase, the house was extended towards the back, adding a loggia (12) behind rooms 11 and 13 and enlarging rooms 13 and 15. The courtyard of the house was surrounded by a number of other rooms still. The first phase of the House of the Skeleton was constructed sometime after 90 BC, occupying several garden lots previously belonging to older houses.

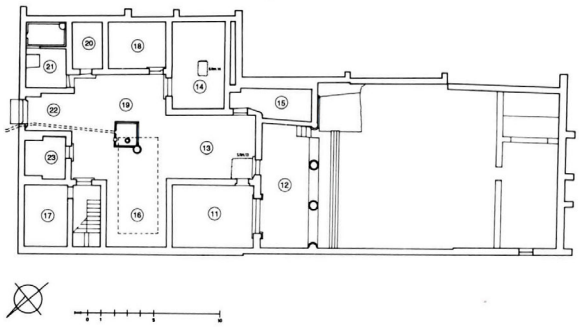


Figure 15. House of the Skeleton, diagrammatic plan (Bruno and Scott 1993, fig. 32)

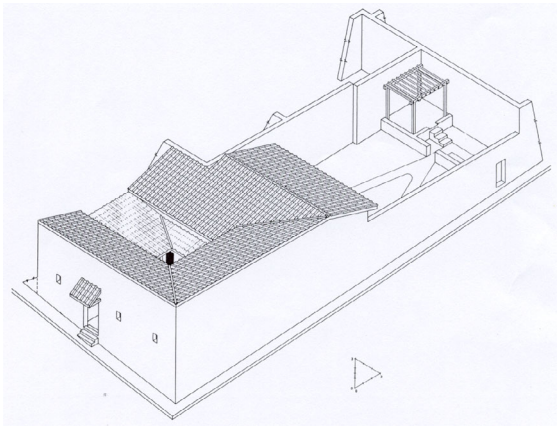


Figure 16. House of the Skeleton, restored elevation (Bruno and Scott 1993, fig. 36)

The original plan of the house was a square, measuring 17.50 m on each side[176]. Within this square, the impluvium basin, itself a square, was positioned in the exact centre. However, the system of squares-within-squares was even more intricate. This was revealed when the courtyard floor was cleared, and a series of drip-lines appeared, defining a large area around the impluvium basin that had obviously been unroofed. The area of the pavement that had been left exposed was damaged and rough, in contrast to the pavement that had been protected by the surrounding eaves. As the excavators discovered, the unroofed space also

[174] Bruno & Scott 1993, 6.
[175] The following description of the house is taken from Bruno 1970, 237-240.
[176] The 17.50 m. of the square probably represents an antique measure of 60'R (1'R = 29.43-29.57 cm). Unfortunately, the authors do not offer further or more detailed measures of the house, which could offer useful information on the original layout and plan.

formed a perfect square (whereas the walls of the courtyard itself do not) around the impluvium basin and within the total square area of the house. Strangely, however, the excavators ignored this clear indication that the unroofed area around the impluvium was part of an original and intended design. On the presence of the impluvium, they say with surprise: "The presence of an impluvium in the floor of a central space in the House of the Skeleton suggests that it was the intention of the builders to construct an atrium roof, yet no evidence was found for such a roof or for a compluvium"[177]. Although Bruno and Scott admit that the arrangement of a square within a square was part of the basic layout of the house, and the unroofed area thus a part of its plan, they refuse to believe that this was the desired end-result for this house. They hypothesise about what may have happened at the building site to create such an unlikely feature as an unroofed courtyard with an impluvium basin at the centre. The most likely solution that Bruno and Scott come up with is that the construction of the intended atrium roof was put on hold when it was interrupted by the acquisition of three more garden plots, which were then used to create the porticus and garden at the back that were not part of the original design. As they put it: "A square frame of beams would have supported the compluvium over the square impluvium, and the fact that the drip-lines do form a square is perhaps the strongest proof that an atrium was intended"[178]. Apparently, the idea of a well-designed town house with an impluvium basin set in the centre of an unroofed area, was so utterly unthinkable that the excavators preferred to ignore the metric evidence in favour of a reconstructed history of interrupted building with a compluvium-impluvium arrangement as an intended end-result[179]. I fully agree, on the other hand, with the solution offered by Wallace-Hadrill, who describes the open courtyard of the House of the Skeleton, partly covered by overhanging eaves on the NE and SE sides, as a decent compromise between two conflicting needs: the need for light to illuminate the rooms and the need for shelter from bad weather. He also gives social meaning to this solution, both from the perspective of a visitor and from an inhabitant. For the visitor, the system of overhanging eaves would create a clear contrast between the closed rooms, which remained relatively in shadow and inconspicuous, and the open rooms to the right (ala and tablinum), which would be perceived as light and accessible. For the inhabitant, however, the eaves protecting the closed 'private' rooms meant that they could be accessed in all weathers for everyday use, while the tablinum and ala were only used on occasion[180].

3. 'ATRIUM HOUSES' OUTSIDE THE ITALIAN PENINSULA

The identification of houses as typically Italic or Roman, based on a comparison with the Pompeian atrium house also extends to research of private architecture in areas of the

---

177 Bruno & Scott 1993, 117.
178 Ibidem, 118.
179 The fact that an impluvium basin could indeed function as a water-collection point within an open courtyard house is proven by Nappo's research in Pompeii, house I 20, 4 (Nappo 1993).
180 Wallace-Hadrill 1997, 229.

Roman Empire outside the Italian peninsula. This topic will not be discussed in detail here, but will be highlighted by some examples. Yves Thébert did extensive research into the domestic architecture of Roman North Africa. Regarding the houses of the African ruling classes, he typifies their houses as peristyle constructions, with the peristyle copied from Greek architecture. According to Thébert, "the traditional Italic house with atrium, or entry hall with open central portion (meaning a compluviate roof) just off the vestibule, was unknown in Africa"[181]. Rather, the African houses were constructed around colonnaded courtyards and vast, unroofed central spaces. Clearly, he based his conclusions on a comparison to the spaces labelled as atrium in the Pompeian houses. Allison rightly warns us of the dangers of this comparison, as we have no primary data confirming that the label 'atrium' fits the Pompeian evidence, which then in turn cannot be used for labelling such spaces in North African houses[182]. Considering the fact that some of Pompeii's classic examples of the oldest, 'true' atrium houses, such as the Casa del Chirurgo (VI 1, 10), were in fact, as discussed above, probably originally constructed with an open central courtyard, Thébert's deductions on the meaning of the North African houses are on shaky grounds. He interprets their failure to resemble what he considers the epiphany of Roman culture, the atrium house, as proof that 'African domestic architecture was not a mere by-product of Italic architecture but stood in its own unique relation to the dominant culture of the Mediterranean world. Africans managed without atrium-equipped houses and did not await the Roman conquest to discover the peristyle'[183]. The fact that North African architectural practices did not slavishly follow Roman rules and were at least partly based on local traditions may very well be true, but to make this statement based on the fact that the houses of the ruling class did not resemble the Pompeian examples is risky to say the least.

Similarly, Simon Ellis, in his discussion of Roman housing in the Empire's provinces, repeatedly dismisses houses from the 'atrium house category', because they lack one or more of the typical Vitruvian elements. For example, regarding House 1 in the Roman colony of Ampurias on the northern end of the Costa Brava, Ellis remarks with uncertainty that there appears to have been an atrium, but it does not seem to have been associated with either a tablinum or alae[184]. Or, when discussing Vaison-la-Romaine (Vasio) in the Provence, he comments on the House of the Silver Bust, where an atrium has been claimed to exist, that it had such a proportionally large unroofed area and so many columns (12) that it may be more correctly termed a peristyle[185]. Regarding the North African provinces, Ellis agrees with Thébert that no traces of atrium houses have been found there[186]. The insistence on comparing the houses of the ruling classes in the Roman colonies to the Pompeian examples,

---

181 Thébert 1987, 325.
182 Allison 2001, 191.
183 Thébert 1987, 326.
184 Ellis 2000, 29.
185 Ibidem.
186 Ibidem, 31.

and particularly the presence of an atrium with impluvium and compluviate roof, yet again illustrates the mindset in which these studies were conducted.

The development of the atrium house: alternative views

The above-mentioned examples of early Italic housing create a good picture of the problems that influence the majority of attempts to reconstruct the development and origins of the 'atrium house'. Generations of scholars have been and still are under the influence of the founders of our ideas about the ideal Italic/Roman house, influential people such as Mau, Nissen and Patroni. The convergence of the Vesuvian evidence and Vitruvius' writings has led to an intensive search for a standard Roman house, with the compluvium-impluvium arrangement considered the most crucial element. This concept of 'the typical Roman house' has tended to obscure the fact that the standards to which these houses were constructed were very flexible[187]. Plenty of examples are known where the excavators make an attempt to fit the often-scanty evidence of houses, which contain certain features of the 'ideal house' (such as fauces, central court, tablinum or alae), into the Vitruvian tradition of impluviate atria with a compluviate roof. The picture of the ideal atrium house is clearly on the excavators' minds, when they make their reconstructions of early houses in the Etruscan colonies and the city of Rome; where necessary, the archaeological material is enriched by textual evidence or by using the architecture and decoration of Etruscan tombs to fill in the gaps. When the evidence clearly indicates the absence of a compluviate roof and the house is thus centred on an open courtyard, the link with the Vesuvian houses is quickly dismissed.

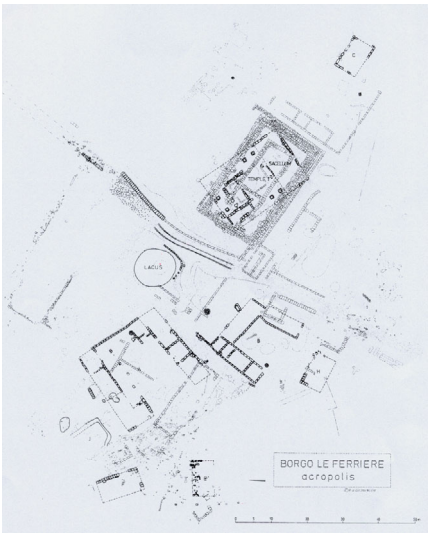


Figure 17. Le Ferriere, Acropolis. Building plan with the two large courtyard houses A and B (Maaskant-Kleibrink 1991, fig. 22a)

1. ARCHAIC COURTYARD HOUSES

Only a few scholars are willing to break free from this Vesuvian-Vitruvian heritage and consider other elements in Italic housing as the links that tie together the 'atrium-family'.

In this family, the common gene is not the roof structure, but the disposition of rooms, large and small, open and closed, around a central space, whether roofed or not[188]. If we accept this new approach to the development and origins of the atrium house, we enter a

[187] Evans 1978, 175; Cahill (2002: 194-195) describes how a similar situation has occurred in the case of ancient Greek architecture, where the well preserved houses of Olynthus have also led scholars to create a type house. Hoepfner and Schwandner (1986) in particular claim that all Olyntian houses were originally identical and explain all the major variations as later modifications. In their perspectives, the type house itself was a symbol and material expression of Greek cultural ideals, very similar to the way the atrium house has been identified as the materialization of Roman culture.

[188] Allison 2001, 223.

much wider area of potential family-members, dating from as early as the seventh century BC and ranging from the large houses of the well to do to the smaller row houses of the middle-class or peasant smallholders. Numerous examples are known of early courtyard houses in the Italian peninsula. The first example I would like to point out is at the site of Borgo Le Ferriere (Satricum), where two large archaic courtyard houses were built shortly after 600 BC, probably sometime between 580-560 BC[189] (Fig. 17).

These courtyard buildings A and B were of a type with two large wings flanking an internal court, which had a closed wall on the third side. On the inside, one or more porticoes flanked the wings. According to the excavator at Satricum, M. Maaskant-Kleibrink, a wider study of archaic courtyard buildings in Central Italy has revealed a marked uniformity in the layout and build-up of this typical aristocratic domestic architecture. Amongst other features, the considerable length of the wings is a point in case, and also the fact that many of the rooms in the wings opened onto the courtyard and were usually not connected to each other. More meaningful is perhaps the regular orientation and the pattern of division of the wings into rooms, as well as the regularity in the measurements of the individual rooms. In Satricum, Maaskant-Kleibrink identified three types of rooms that occur each time (Fig. 18): small rooms (4.80 x 3.40 m), square rooms (4.80 x 4.80 m) and large rooms (4.80 x 8.20 m).

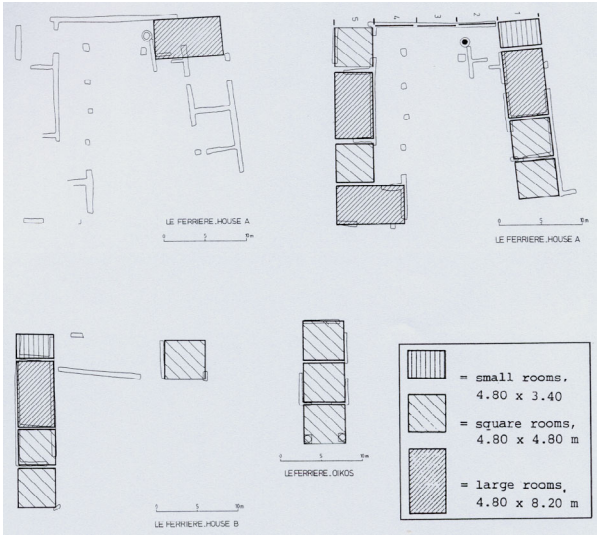


Figure 18. Schematic reconstruction of building system used for the courtyard buildings at Le Ferriere (Maaskant-Kleibrink 1991, fig. 25)

She also recognized these measurements in courtyard buildings in two other Central Italian sites, Acquarossa (near Viterbo) and Veio. This could indicate that a regular building system existed for the construction of large courtyard houses during the early archaic period, with a mathematical construction based on a basic unit of 4.80 m[190]. The layout of these buildings also shows similarities with a recurring set of rooms always consisting of a larger rectangular one flanked

[189] Maaskant-Kleinbrink 1991, 91.

[190] Ibidem, 94-99; figs. 28 A-D. Maaskant-Kleibrink offers a possible mathematical system for the construction of these early Archaic buildings, whereby a (3.4), b (4.8) and c (8.2) could be measured out by the drawing of a few circles based on a ratio that is between c and b and that equals the ratio of the lengths of the two orthogonal sides of a right angles triangle, where the hypotenuse has twice the length of the smallest side. The ratio between c : b should then equal 1.73, and the ratio between a : b should equal .73. By assuming that measure b has to be adjusted slightly to 16 Roman feet (16 x 0.296 = 4.74), the ratios are as follows: c : b = 1.73 and a : b = .72.
The choice to adjust b to a measure in Roman feet seems to me rather unlikely, as we are dealing here with early buildings from the early archaic period. The ratio between the measures a : b : c can also be expressed in the following geometric proportions: 3.4 : 4.8 : 8.2 = 1 : √2 : 1 + √2, also based on a simple figure of a 3.4 x 3.4 square and the diagonal of that square.

by smaller square ones or vice versa and with a portico in front. This type of large courtyard building was a common phenomenon in the archaic period. In all Central Italian settlements there is proof of such monumental buildings consisting of long wings, which in turn were divided into rooms and seem to consist of a set of – at least- one rectangular room flanked by square rooms or vice versa. Besides Le Ferriere, Acquarossa and Veio, this type of building is also known from Ficana and Lago dell'Accesa[191]. At Murlo near Sienna, excavations revealed a much larger rectangular complex, consisting of four blocks of rooms surrounding a central courtyard. A portico lined three sides of the courtyard, providing a sheltered walkway. The excavated building dates to 575 BC, but has a predecessor in the seventh century[192]. The similarity of this monumental structure (four wings in a square with measurements of 62 m.) with the courtyard houses (squarish with measurements of ca. 25 m.) is much less striking, but it seems impossible to deny a link between them. While the west wing of Murlo's 'palace' is divided entirely into regular square rooms, the south wing shows the familiar division of two rectangular rooms and smaller square rooms in a pattern similar to the other courtyard houses[193].

If we accept that the 'standard' atrium house as found at the Vesuvian sites is related to the early Italic courtyard houses with their regularized building plan, we may agree with Ross-Holloway, who assumes that the atrium was open rather than closed in its original form and considers its development from the open, agrarian courtyard a result of urban lack of space: "The atrium house is only the end result of the adaptation of the courtyard house to increasing urban congestion. When there is little feeling of crowding not even courtyards are necessary. The Acquarossa house is the first stage of adaptation to urban conditions, as are the courtyard houses of Greek Megara Hyblaea in Sicily. The atrium house shows compression advancing to the point that the courtyard, which has lost whatever agricultural functions it may have served earlier, has become vestigial, no more than a light well"[194].

2. THE EXTENDED ATRIUM-FAMILY

If we use the criterion of the disposition of rooms, large and small, open and closed, around a central space, whether roofed or not, to identify houses belonging to the 'open atrium-family'[195], we may also include Nappo's four types of row houses[196], as well as the row houses from Roman colonies such as Cosa. Even though the houses with an impluviate atrium are based on different

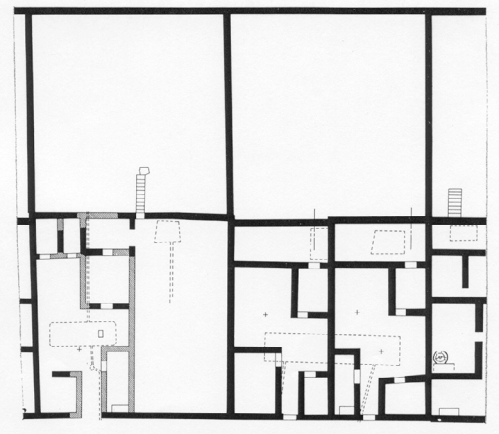


Figure 19. West block at Cosa, houses of the 2nd century BC (Bruno and Scott 1993, fig. 5)

[191] Ibidem, 103.
[192] For a detailed description see Ross-Holloway 1994, 55-63.
[193] Maaskant-Kleibrink 1991, 103.
[194] Ross-Holloway 1994, 63-64.
[195] The term 'open atrium' is introduced by Wallace-Hadrill, 1997.
[196] Supra n. 14.

architectural principles than the row houses, there are also close links between the two types. For example, the build-up of the houses in the west block at Cosa[197] (Fig. 19), dating to the second century BC and the build-up of Nappo's type 1 (Fig. 20) is very similar and contains features that are also common to the atrium-type houses: the entrance corridor between two flanking rooms, the general organisation of space of front rooms/central court/back rooms/garden and the pattern of contrasting types of rooms, large and small, open and closed[198].

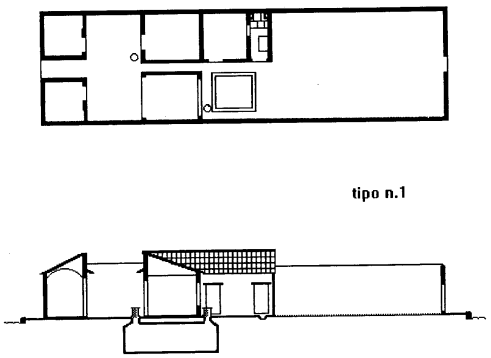


Figure 20. Nappo's type 1 (Nappo 1997, fig. 6)

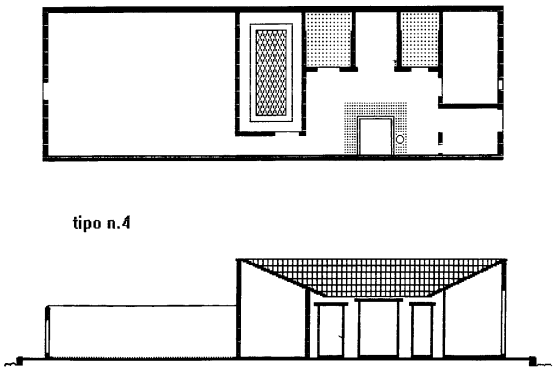


Figure 21. Nappo's type 4 (Nappo 1997, fig. 17)

Arguably, the textbook atrium house has a much more elaborate arrangement of rooms, and its design is based on a high level of symmetry, with a tablinum on a central axis with the fauces and atrium, and flanked on both sides by alae. In reality, however, the atrium house does not exist in one perfect form, but in an endless array of varieties, more often than not lacking one or more of the elements that would typify it as the 'true atrium house'. Numerous examples are known of atrium houses that have only one or no side ranges at all, either because the building site was too restricted in width, or because they were sacrificed in favour of giving the atrium a respectable width and suitable proportions[199]. In some cases, an imitation in stucco of doorways on the sidewalls of the atrium was applied to create the illusion of side ranges where there were none. Or, as for example in the Casa della Calce (VIII 5, 28), the back range of rooms including the tablinum is totally missing, and the atrium is directly connected to the peristyle behind it. Other houses only contain one ala or none at all. On the other hand, Nappo's type 4 (Fig. 21) of the Pompeian row houses shows a clear

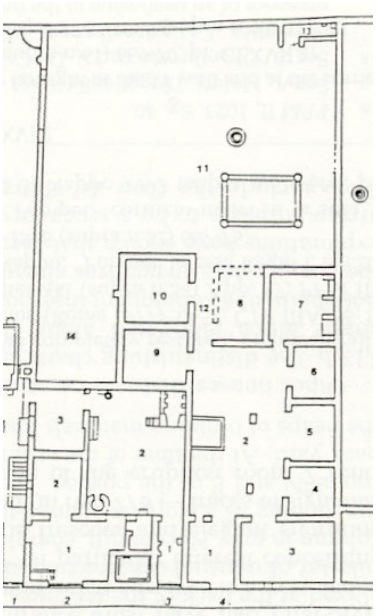


Figure 22. House I 20, 4 (Nappo 1997, fig. 18)

[197] Bruno & Scott 1993, 15.
[198] Wallace-Hadrill 1997, 222.
[199] Evans 1978, 177.

resemblance to the traditional atrium house, with side rooms on one side of the court, containing an open room which may have functioned as a tablinum or ala, and, more noticeably, an impluvium. House I 20, 4 is a good example of Nappo's type 4 (Fig. 22). Here, the presence of the impluvium led scholars to reconstruct a matching compluviate roof. This is now clearly denied by Nappo, who has demonstrated that the roofline never formed a compluvium, but a partially sheltered walkway in an L-shape along the east and south walls, supported by two pilasters[200].

3. TOWARDS A NEW DEFINITION OF THE URBAN HOUSE

These examples of 'incomplete' atrium houses on the one hand, lacking one or more of the principal components of the textbook model, and the rather elaborate row houses on the other hand, demonstrate that there is actually an area of overlap between the different types. If we can get away from the focus on the compluvium-impluvium arrangement, and look at the arrangement of rooms around a central space instead, there is a family resemblance between the two types. The row houses represent a need for simple and cost-effective building, with limited space, practical solutions and no architectural freedom. But in the atrium houses, too, compromise is a key factor in the design and construction. Only a handful of house owners could actually afford to buy so much land in the city as to allow the construction of a perfectly executed symmetrical design. In most cases, the architect's skill was tested by the need to trick the visitor's eye into assuming symmetry and perfection, where in fact the reality was that the lack of space meant that certain elements needed to be altered or removed altogether.

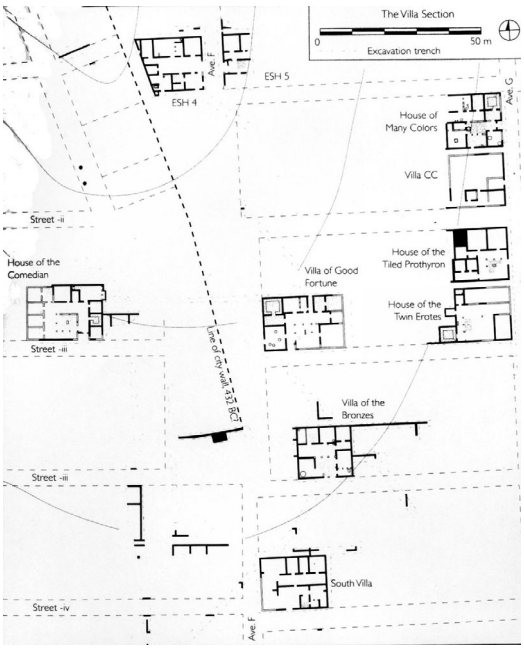


Figure 23: Olynthus. The houses of the Villa Section (Cahill 2002, fig. 8)

The type of house that we have grown accustomed to calling 'atrium house' in its role of the ideal Roman house has been pulled out of context in the extreme. In actual fact, the atrium house, ranging from its perfect execution as in the Casa del Fauno (VI 12, 1), to the average sized houses such as the Casa del Torello (V 1, 7) and finally to the smallest examples, missing one or two side ranges, such as the Casa della Nave Europa (I 15, 1), forms part of a continuous spectrum of town houses. According to the wealth of the owner and his particular wishes as well as the (lack of) available space in the crowded city centre, the different components making up the house were diminished or expanded. In the case of the row houses, these

[200] Nappo 1993, 668; see also Nappo 2007.

components were simply stripped to a bare minimum.

The one element that is always present and can therefore truly be considered the most important space in the house is the central court, whether roofed or not. The suitability of a house plan designed around a (central) courtyard to the Mediterranean climate is also attested by the numerous examples of courtyard houses in ancient Greece. The archaeological evidence of houses in Olynthus offers a good parallel for the generalized house plan of the Pompeian atrium houses[201]. Inhabited for a relatively short period of time (between approximately 432-348 BC), the Olynthian houses were also based on a standardized design – the 'pastas' type – and show a general conformity in plan (Fig. 23).

Most houses at Olynthus were centred about an open courtyard, positioned in the southern half of the house, and flanked on the north side by a long portico (pastas). The majority of the houses had only one portico onto the court, but at least nineteen examples are known with additional porticoes facing the open court, and a few were covered on all four sides[202]. Although the design of the layout of the Olynthian pastas houses does not share any significant features with the Pompeian atrium houses – the Olynthian houses were closed off from the outside world and lacked a strong hierarchical structure in the layout of rooms – the focus of both house types was on the (semi-) open court. The significant role that the central courtyard played was dictated by its functions, which were practical and fulfilled some of the basic household needs: providing a protected space as the centre of the household, collecting rainwater and illuminating the rest of the house. The portico(es) provided spaces that were protected from the elements but still benefitted from the qualities of the court.

The important social function of the atrium within the Pompeian house and the strong traditional values that were bestowed upon it must be considered secondary to its practical roles, even though this may have been pushed to the background in the memories of the successive generations of house owners. In fact, the presence of a central court in many of the smaller row houses, as part of a simple and easily adjustable scheme, shows that this structure did not necessarily offer any significant differentiation or hierarchy to a building. Only in the larger houses did the orientation of the more important rooms opposite the entrance and the position of the alae create a clear dynamic in the layout of space, which was orientated along the central axis of the house. This axis served as a scale, along which the significance of individual rooms could be read, with the more insignificant rooms at the front of the atrium complex and the most significant rooms at the back[203].

The development of the atrium house: final considerations

It is evident that the courtyard house was one of the most common and widespread house types in the ancient Mediterranean world. Outside the Mediterranean it was adopted as

---

[201] For a recent discussion on the houses of Olynthus see Cahill 2002.
[202] Cahill 2002, 75-79.
[203] Dickmann 1999, 102-103.

a new house form in the provinces of the Roman Empire with many examples known from areas such as Roman Britain, France, Spain and North Africa. The earliest known courtyard houses in the Italian peninsula date to the seventh century BC and form the start of a longstanding tradition in domestic architecture of houses constructed with some kind of central courtyard with a number of rooms surrounding it and opening onto it. As discussed above, the scholarly focus on the presence of a compluvium-impluvium arrangement as the crucial element of the atrium house has since long excluded this house type from that long tradition of courtyard houses and placed it in a different tradition altogether, as the 'materialisation' of Roman culture. By excluding it from the context of Italic housing in general, tracing the origins and development of the atrium house became an arduous task and a nearly impossible mission. Early 'examples' of atrium houses were reconstructed from material remains that might also be interpreted otherwise (i.e. Marzabotto, the houses at the foot of the Palatine hill). On the other hand, when an early house that seemed to resemble an atrium house did not meet the required standard, it was described with disappointment and surprise (Cosa).

It appears much more fruitful to propose that the atrium house is nothing more than a variant in the courtyard-house-family. As we saw, even the earliest examples of courtyard houses were subject to some kind of regular planning[204]. Perhaps they already form part of a tradition of formalized house planning around a central court, a tradition that subsequently evolved over a period of centuries and was subject to many adaptations, starting as houses in the countryside with plenty of space to town houses in a crowded city centre such as Pompeii. Placed in this much wider context, the role of the atrium house was perhaps not quite as important as has been supposed by modern researchers. The 'problem' here may be the one that Pompeianisti are often dealing with: the outstanding preservation of Pompeii's monuments, including its domestic architecture, influences our perception of the importance that it had in ancient times. Add to that the fact that the best-preserved written source on architecture gives a rather detailed description of the atrium house, and a legend is born. Undoubtedly, the fact that Vitruvius discussed this house type means that it was common in the ancient Roman world, but it also means that this was apparently a house type that was normally constructed with the help of an architect. It seems reasonable then to assume that the atrium house was a type of residence reserved for the well to do and it is here, in its social role that the atrium house does indeed take on an important role in the architectural history of Italic housing[205]. Because even though it may be just one element in a long tradition, its layout and in particular the great symmetry and axiality that was part of the design does have particular meaning.

We may have come closer to understanding the position of the atrium house within the historical development of Italic domestic architecture by redirecting the focus from the

---

[204] Supra n. 189.

[205] The social functions of the atrium house and the ongoing research in this field will be discussed in detail in the following chapter.

compluvium-impluvium arrangement to the central court with its surrounding spaces. This does not, however, explain why many of the Pompeian houses, and presumably also houses in other cities, had a compluviate roof structure. The mentioned examples of urban houses with a (partly) open courtyard, some even containing an impluvium basin, indicate that the compluviate roof was not a practical necessity in term of water collection, illumination or the provision of shelter from the weather. In fact, the illumination of the house must have been better with an open courtyard and overhanging eaves on one or more sides of the courtyard could have provided enough shelter. As far as the collection of rainwater is concerned, we now know that the impluvium basin is only one element in a large system of water management that may be relevant both in an open court and in one with a compluviate roof[206].

Assuming that the atrium house with a compluviate roof was the end result of the adaptation of houses with an open courtyard, we have to wonder why and when this trend of closing the courtyard roof was initiated. At first sight, the addition of a roof to the only open space in the house seems a rather unlikely choice, as it reduced the house to a dark box. We should therefore perhaps not look for the reason in practical terms, but consider the way in which people perceived the house and wanted it to be perceived by others as the idea behind this change. A possible reason for the addition of a roof to the central space of the atrium house is suggested by Wallace-Hadrill, who links this event to another change in Italic domestic architecture, namely the addition of the peristyle-garden. The spread of the fashion of the peristyle as a new Hellenistic element and the way in which it modified the traditional spatial disposition of the atrium house was studied in detail by J.-A. Dickmann[207]. He has recognised three stages of development during the course of the second century BC, with the peristyle as the focus of the major entertainment rooms as the end result. The addition of the peristyle to the atrium house had some major implications, one of them being the introduction of a new large, open and bright area that had an effect on the play of light and shade in the house. It is here that Wallace-Hadrill sees part of the reason for the closing of the atrium, as a deliberate contrast is created whereby the peristyle is situated at the back of the visual axis as a bright and attractive area beyond the relatively dark atrium and the transitional space of the tablinum. Whereas before, the atrium was the main source of light for the house, it can now borrow light from the peristyle, which not only made the enclosing of the open atrium possible, but desirable[208]. The variety of light levels within the house is also mentioned by Carol Martin Watts. The pragmatic solutions to the problems of lighting, such as the atrium, serve not only as light sources, but also as organizing features in the plan

---

[206] Wallace-Hadrill 1997, 232.
[207] Dickmann 1997, 121-137; the changes in the atrium house with the addition of the peristyle-garden will be discussed in more detail in the following chapter.
[208] Wallace-Hadrill 1997, 234-236.

of a house. The 'tapestry' of light and dark is an important factor in the perception of architectural space[209].

This hypothesis, linking two events in the development of the atrium house together, certainly merits further attention and investigation. To my knowledge, it is the only attempt that has been made to try to explain the presence of the compluviate roof of the Pompeian houses, rather than simply copying Vitruvius without any critical assessment of the material remains. It should, however, be tested in the field, a job that might prove to be rather difficult or even impossible. For what about the majority of the houses that already existed when the peristyle-garden was added? In most cases, and certainly in all cases studied in this research, these houses originally had some type of garden-area at the back, which was later modified or expanded to form a peristyle. Even though the original garden was probably not integrated in the architectonical disposition of the house, it was certainly a source of light from which the atrium could borrow. So as far as that argument goes, the atrium could have already been covered by a roof without turning pitch dark. But, I think that what Wallace-Hadrill tries to convey, and what would certainly seem the case to me, is the meaning of dark versus light, and not in a practical sense. Perhaps further stratigraphic excavations such as those conducted by Maiuri could bring us closer to understanding the matter at hand, although proving that the covering of the atrium and the addition of the peristyle was a simultaneous act will probably remain problematic.

As far as the question of the origins and the development of the atrium house are concerned, this chapter has not given any conclusive answers, nor has it tried to. I would argue that in reaching these answers, the most important step is to realise that our familiarity with the atrium house and the extraordinary position we have given it, created by the material remains of the Vesuvian sites and the writings of Vitruvius, are mostly false. The 'atrium house' - a misleadingly precise term, which conjures up all sorts of expectations for a category of houses that was, in practice, subject to endless variation - is nothing more or less than a variant within a continuing tradition of houses with patterns of rooms constructed around a central court. The atrium or central court was a basic building block, which could be adapted to create both the grandest and more modest houses alike[210]. The type of house that we encounter in Pompeii and forms the subject of this research is a specialized adaptation for an urban elite, a group of people whose identity and demands are also constantly changing. For this specific type of highly developed urban courtyard house, the metrological analysis as presented in this study, can create additional insights regarding the people's perception of their house and the meaning of its spaces as components of the overall design, as well as in the particular relationship between the two main living areas of the house: the atrium and the peristyle. Chapter V will be dedicated to these and other issues concerning the design and meaning of these houses.

---

[209] Martin Watts 1987, 137-141.
[210] Wallace-Hadrill 2007, 285.

CHAPTER V

THE SOCIAL-HISTORICAL CONTEXT OF THE ATRIUM-PERISTYLE HOUSE

Introduction

The final chapter of this study of Pompeian atrium-peristyle houses aims to form a synthesis between the information and knowledge on these houses in their social-historical context that we already possess from other studies, and the new information that can be added from the metrological analyses of these houses. The questions that are posed here are not innovative as such, but are those questions that have already proven to yield the best results regarding the material remains we have at our disposal. These same issues will here be looked at from a new angle, that of the metrology. The separate metrological analyses of the atrium houses and peristyle-gardens not only lead to an understanding of the different methods of design that were applied in private architecture in pre-Roman Pompeii, together they can also be used as keys, which, from a specific viewpoint, inform us on the relation between these houses and the society within which they functioned**.**

The ancient city of Pompeii forms an excellent ground for this type of study, because in any city with a differentiated community, houses are a way of expressing social position and wealth. As Andrew Wallace-Hadrill puts it: "*In its shapes and patterns, dimensions and sequences, ornament and decoration, a house in effect stores away all kinds of aspects of the whole rhythms of social life*"[211]. To the contemporary users of the house, these aspects were self-evident and self-explanatory. To us, unfortunately, they are not immediately clear, as we lack the necessary ancient experience. Mark Grahame points out that a big danger lies in the fact that the ancient city of Pompeii is reassuringly familiar. When walking around, we do not feel ourselves to be in an unfamiliar world but in one with features that we can readily recognise, a world like our own with streets, buildings and houses. We therefore tend to identify with these houses and see them as containers of private life for people just like us and, as a consequence, apply our own language terms to these remains without considering the effect this has[212]. To overcome this hindrance of our modern, and biased ideas, we need to try and decode the social codes that are engrained in the architectural remains, in other words, to decipher the language they were written in.

---

[211] Wallace-Hadrill 1994, praef. xv.
[212] Grahame 1997, 138.

The atrium-peristyle house

Any study of private architecture that aims to say something about aspects such as function, use and social value, should consider a house in two ways, as a living unit on its own and as part of the wider (urban) landscape. Firstly, as a living unit, a house was expected to offer room for a number of different functions. Some spaces may have been designed particularly for one function, and allocated a specific place within the total layout of the house (e.g. the kitchen). Other spaces were intended to fulfil multiple purposes, some appropriate for the gathering of large groups of people and others more suitable for a private tête-à-tête. Also, within the overall plan of a house, certain spaces were considered – in our modern terms - more 'public' in nature, whilst others were more 'private'. In recent years, there has been much debate on this issue, and the modern terms public and private have been proven to be inadequate in explaining how the atrium-peristyle house functioned in the day-to-day social life. The house of an elitist member of Pompeian society was much more than just a private retreat, as it played an active role in the exchange of its owner's status and power to those who were invited inside as well as those passing by. This topic will be discussed in detail below. The above-mentioned factors, the different functions of spaces and their internal hierarchy, as well as the owner's status and wishes, played a role in the process that preceded the construction of a house: the purchase of a suitable building plot, a commissioned design, the ensuing negotiations and the necessary adjustments. The intended result was a house that was appropriate for its purposes, complied with the rules and expectations of society and, not in the least, was agreeable to its owner.

Secondly, the house is considered in the general context of its surroundings, in this case that of the urban fabric of Pompeii, the city that formed the décor and normative framework for its existence. The design of a house was never merely a summing up and putting together of the internal elements that had to be present for it to function according to the expected standards. On a more detailed level within the general urban context, the design was adjusted to the specific location that it was built in. For example, a house that was constructed at a busy crossroads may have had a proportionally large part allocated to commercial or industrial purposes, whereas a house on a back road would have had no use for such facilities. Also, the nearby presence of public buildings, such as the theatre or baths, or the vicinity of a property to a city gate, were factors that made the purchase of a plot of land more or less attractive in view of the character of the intended building project. For many of the elite houses, the social-political aspect was a dominant factor, expressed in impressive façades, preferably located near the political centre and on one of the major roads.

Views on private architecture

Ancient private architecture can be studied from a number of different viewpoints, and the excellent preservation of the houses in Pompeii has attracted the attention of many scholars. The last few decades in particular saw a steady increase of the number of studies of ancient social life from the perspective of the house. The focus of these studies is towards

understanding the house as an integrated social living unit, in contrast to the more traditional approaches focussing on single aspects of these houses – the architecture, the different types of decoration and single artefacts of particular value. Current studies tend to focus on the contextual interpretation of these different categories of material culture, which are most informative when considered in relation to each other.

Besides the information on ancient private architecture through fields of study such as archaeology, art history and social history, some of the key questions of this research can also be regarded from an anthropological viewpoint[213]. For the metrological research in question, there is one study in particular that offers valuable information and suggestions. Gianetta Murru Corriga studied the role of traditional masons in Sardinia in the construction of houses during the first half of the twentieth century[214]. By including the anthropological angle, we are offered the possibility to gain insight in some of the processes that play a role in the tradition and practice of private architecture, which are not always recognisable or verifiable by archaeological and historical research alone.

CURRENT QUESTIONS AND ANSWERS

To understand the social meaning of the atrium (-peristyle) house in Pompeii means to understand the society it formed a part of and the way in which it functioned within the social codes and rules of that society. To achieve this understanding, we must look at a wider perspective than that of the city of Pompeii alone, not only because, in itself, it does not offer enough evidence to create a comprehensive framework, but also because this town, at least from the second century BC onwards, formed an integral part of the Roman world, and thus also of the different aspects of Roman culture. The nearby presence of villas belonging to the Roman elite, spread along the bay of Naples, set a direct and tangible example for the Samnite ruling class of Pompeii.

The role of the house of an elite member of Roman society was far removed from our own experiences. The general views on this theme have been extensively studied and are now 'common good' to those with an interest in this topic[215]. Contrary to our appreciation of the privacy of our home and the possibility it offers us to get away from public scrutiny, the Roman house played a central role in public life. Moreover, the house of an important member of society played a crucial role in the exchange of his status and wealth to its

---

[213] The current research does not offer enough space to include a wide anthropological study. One such study in particular, however, offers the perspective of information on building in ancient Pompeii that is difficult or impossible to gain through archaeological and historical research methods alone. This study is concerned with traditional building practices on the island of Sardinia, and will be used where possible to offer us additional insight in different aspect of the traditions and practices of private architecture.

[214] Murru-Corriga 1994, 41-68.

[215] For a comprehensive description of the social structures of the Roman house see in particular: Wallace-Hadrill 1994 and Zanker 2000.

visitors. The fact that the house should reflect and enhance its owner's status is clearly illustrated by Vitruvius, who repeatedly emphasised that a good architect was expected to design a house that corresponded to the status and profession of the house owner, who needed a house that would fit his particular needs and comply with the expectations of society. After all, as he puts it, the eminent and wealthy members of society required a totally different kind of residence than those with a less conspicuous role in society[216]. The most common way of portraying one's power and status through the house was by inviting people into the home. These visitors could belong to all social strata and were allowed into the house according to different rules and patterns, and on different times during the day. In the early hours of the morning, the *paterfamilias* would receive his clients in the atrium for the *morning salutatio*, when they informed their master on business matters, and asked him for advice or for financial help. Confidential meetings could take place in smaller, more private spaces. Later in the day, dinner would be served to business relations and peers in the dining rooms adjoining the tablinum or flanking the peristyle-garden. Especially in an urban setting, which formed the centre of political activity, the pressure was high for a noble man to build up a large group of clients who could vote in the elections. As a result of the competitive nature of Roman society and the fact that part of public life took place inside the homes of the elite, the well-preserved houses of Pompeii have the potential to offer us a wealth of information on ancient social life[217].

The concept of 'public' and 'private' space

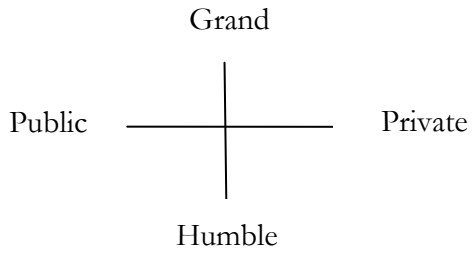
To be able to read the social structures and patterns underlying the atrium-peristyle house, we need to gain an understanding of its unique and dual character, combining the private with the public world within the protection of its walls. This theme was recognised and analysed in particular by Wallace-Hadrill (1994) and subsequently became part of a wide variety of literature on Roman private architecture. To the contemporary users of the house, its structural patterns and symbolic codes must have been self-evident and commonly understood as part of a longstanding tradition. Our present-day experience with domestic architecture, characterised by a clear separation of the private from the public world, leaves us with a handicap when attempting to interpret Roman domestic space. Besides the fact that the significance we give to the terms 'public' and 'private' is not applicable to the 'language' of the atrium-peristyle house, we are further hampered by the fact that the social codes expressing that language – design, architectural features, decoration patterns, artefacts – are only partially available to us, their meaning often not immediately clear.

To get a sense of the subtle differences between 'public' and 'private' in the Roman house, two experiences which cannot simply be juxtaposed as black-white, but form part of a

---

216 *De architectura*, VI 5, 1-3.
217 Wallace-Hadrill 1994, 5.

whole spectrum ranging from the completely public to the completely private, Wallace-Hadrill introduced two sets of contrast, presenting them as separate axes[218]:



Within the space of the house, movement along the two axes can take place simultaneously and in all directions. For instance, the atrium of a noble house can be grand and public, whereas a cubiculum in that same house is grand and private. A service room may be humble and private, a shop or corridor humble and public. As a consequence of the specific nature of a room, it would be accessible to different people. The large mass of uninvited clients would be permitted to enter the atrium, whereas only a close friend or business relation would be invited into the privacy of a cubiculum. It is in these particular workings of the house that we get a true sense of the meaning of 'public' and 'private' space. The different rooms offered more or less privacy in relation to each other, whereby gaining access to a more private space was a privilege, for it represented a closer relationship to the master of the house. Vitruvius' description of the architect commissioned with the design of a house (VI, 5), who needed to distinguish between the private areas (bedrooms, dining rooms, baths) and the public areas (vestibules, halls, peristyles), has to be read in this context. The contrast he speaks of is not between space reserved for the family and that for visitors, but between space for invited and uninvited visitors[219].

Dickmann offers some critique to Wallace-Hadrill's presentation of the concepts of 'public/private' and 'grand/humble', which are only concerned with the perspective of the *dominus* and not with the sentiments of the different groups of visitors (ranging from *amici* to *clientes*). Dickmann illustrates with the following example: the assessment of the atrium as a 'grand and public' space mostly concerns the opinion of the *dominus*, for it is he who receives his *clientes* and *amici* there. However, for a special visitor who was granted access to one of the more private spaces surrounding the peristyle, the atrium as a reception space was more likely seen as 'humble and public'. Furthermore, spaces such as triclinia or cubicula - 'grand and private' in Wallace-Hadrill's description – had a more public character during the evening dinner, at which time they were probably also classified as 'public and grand'. Dickmann hereby raises the issue that the straightforward juxtaposition of public/private and grand/humble is not sufficient to accurately describe individual spaces and proposes that these criteria be united in one linear scale that allows us to assess a room's significance. To

[218] Ibidem, 11.
[219] Wallace-Hadrill 1994, 44-45.

make a proper assessment of a house and its spaces as 'social space', we cannot rely solely on the determination of a room type, but need to include the interaction between host and strangers, who may both experience a different set of criteria during the same encounter[220].

The 'language' of domestic space: the multi-functional character of rooms

What interests us most in our studies of the Pompeian houses or (pre) Roman houses in general, is how they functioned on a daily basis as a centre of social activity. Or, in other words, recognising the spatial aspects of household behaviour. But, is it even possible to assign specific functions or rituals to certain spaces in the house? The methods used in earlier studies of atrium (-peristyle) houses, whereby the ancient nomenclature from the textual evidence was used to identify certain spaces and explain their functions, is no longer acceptable[221]. This form of analogical inference created a straightforward picture of rooms and their functions - a cubiculum was a bedroom, a triclinium a dining room – that is still persistent in our conception of these houses today. Recent studies of artefact assemblages in particular revealed that we have been working with an oversimplified view of the spatial patterns of activities taking place within the home[222]. These studies aim to analyse the artefacts in their appropriate domestic context, something that was never attempted before. In the traditional approach of classical archaeological studies, artefacts were usually removed from their context, categorised and reviewed in typological studies. Clearly, this causes problems for those attempting a contextual research, the more so because the original excavators were often not that concerned with making detailed notes of the artefactual finds and their provenance[223]. Despite this 'handicap', two people in particular have done much work in the field of contextual artefact studies, namely Penelope Allison and Joanne Berry. Notably, the most important conclusion of their studies is the fact that the artefact patterns within the houses frequently showed a distinct lack of correlation between size, decoration and artefact assemblage of a room. In other words, the contents of a room failed to match the expectations raised by architectural form[224]. The latest views on the interpretation of artefactual finds in relation to the architectural and decorative remains were presented by Allison in the recent overview of Pompeian studies 'The World of Pompeii' and are outlined here[225]. Her investigation of thirty houses led to the conclusion that, at least in the latter half of the first century AD, both the atrium and peristyle part of the houses, which were clearly used for the reception of guests and to impress visitors – evidence for this could be statuary, marble tables, basins and shrines in the atrium and pools, fountains, statue bases and dining couches in the peristyle – were also employed for a range of domestic activities. The atrium,

220 Dickmann 1999, 44-48.
221 Allison 1992, 1-8; 2001, 185-190.
222 See also Dickmann 1999, 23-40.
223 On the traditionally limited interest in the artefact assemblages of Pompeii and Herculaneum see Berry 2007, 292-293.
224 Berry 1997, 185.
225 Allison 2007, 269-279.

most notably, was used for the storage of a full range of domestic utensils in cupboards, chests and on shelves, as well as for domestic industries such as spinning and weaving. This evidence reveals that the formal space of the atrium was also the main circulation area for all members of the household. The only activity that was lacking in the artefactual evidence in this part of the house is that related to food preparation and eating. These activities mostly took place in and around the peristyle. Although cooking activities can in most cases be recognised in rooms with a fixed hearth (kitchens), the frequent presence of braziers in the ambulatories leads Allison to reconstruct the cooking there too, perhaps even in front of the diners. Bulk and domestic storage is also widely present in the peristyle-garden, indicating more utilitarian activities in this part of the house too. The artefact finds as a data set have the potential to create a more differentiated picture of the social activities that took place in the house. Most notably, it paints a picture where the more mundane activities and chores were closely interrelated with the more formal aspects, involving the reception and entertainment of outsiders[226].

The portrayed multi-functional character of the different rooms within the houses could lead to a reconstructed picture of complete chaos in the ancient Pompeian household: the *paterfamilias* escorting his business relations through a cluttered courtyard with weaving women, playing children and slaves polishing the silverware. As the house of a noble man was expected to enhance his status rather than ridicule it, this picture does not make much sense. There is, in fact, an important element that must be included in the analysis of these houses, and that is the *temporal* division of space[227]. The movements of the elite through the urban landscape were formally structured in a daily time schedule. This meant that for the largest part of the day, the time following the morning *salutatio* up until the time when dinner was served in the early evening, the male member of an elite household was outside the house. This left plenty of time and space for the other members of that household to participate in whatever necessary domestic and/or industrial activities. Considering that the artefactual evidence used by Allison was mostly from storage finds (cupboards, chests), the 'mixed' message sent by the artefacts and the architectural and decorative evidence starts to make more sense. If the house was freely used by all members of the household during the majority of the day, the evidence of their activities could largely have been stored away by the time the guests arrived.

Mol's study of furniture in houses in Herculaneum also confirms this picture. He concludes that the functional pieces of furniture that were used in everyday life, which were typically constructed in wood, were mostly present in the more private parts of houses, closed off from public scrutiny. Contrarily, the more 'public' spaces in the larger houses

---

[226] The study of houses in Olynthus by Cahill (2002 revealed a similar phenomenon of widely differing assemblages of artefacts found in architecturally similar spaces such as courtyards, porticoes, androns and kitchen complexes.

[227] This phenomenon is described in detail by Ray Laurence: 1994, 122-132; 1997, 7-14; see also Berry 1997, 194.

(atria, peristylia, alae, tablina, triclinia) typically contained furniture constructed in marble or bronze. These heavy pieces were probably not functional in character, but should be considered more as sculptures that formed an additional decoration to the wall paintings and decorated floors, thereby adding to the status of a room[228].

The 'language' of domestic space: architectural layout and decoration

During the times of day when the house did function as the official backdrop for more formal (or 'public) affairs, different elements in the make-up of the house played a role as a 'social guide'. The visitor was guided through the house, allowed glimpses into certain areas, denied access to others, or specifically invited into a private room. The guiding elements are the social codes mentioned earlier, self-evident to contemporaries but written in a 'language' unknown to us. That language was composed of different factors, including the architectural layout – the position of individual rooms and their (hierarchical) relation to each other – as well as certain architectural features and the overall decorative scheme.

The comparison between architecture and language is frequently made, and lies at the basis of two studies, relevant in this context in particular. Carol Martin Watts[229] analysed Roman houses in Pompeii, Herculaneum and Ostia, using a method based on the concept of *pattern language*, which is constructed on the idea that a set of rules can generate the built environment. Mark Grahame[230] analysed atrium-peristyle houses using the *space syntax* theory, the purpose of which is to identify the 'syntaxes' that underlie spatial order. Both methods, the first developed in the late 1960's and early 1970's by Christopher Alexander[231] and the second in the early 1980's by Bill Hillier and Julienne Hanson[232], were not originally conceived as analytical methods, but as tools to aid in the design process of new architectural structures. The results of the two studies that applied these methods to archaeological remains will now briefly be discussed.

Grahame claims that his space syntax analysis of the ground plans of atrium-peristyle houses in Pompeii leads to dramatically different conclusions on the social use of these houses than what we have inferred from the 'conventional' methods used by historians and archaeologists. On the contrary, his conclusions add nothing new to what we already knew, for instance that the open courtyard spaces in the houses facilitated a high level of social encounters ('public' spaces), whereas the rooms that were furthest removed from the entrance, reached by crossing a large number of thresholds, were the most 'private'[233]. Problematic, to my opinion, is the fact that this method of analysis is in no way considerate of the different construction phases within a house. The blocking up of a doorway may for

---

228 Mols 1999, 146-148.
229 Martin Watts 1987.
230 Grahame 1997, 2000.
231 Alexander, C. 1977. *A pattern language*, New York.
232 Hillier, B. & J. Hanson 1984. *The social logic of space*, Cambridge.
233 Allison 2001, 198.

instance have taken place in a relatively late phase, which is not considered in the access analysis (space syntax). Any conclusions reached by this method are inherently only applicable to the final phase of a structure. Eleonore Leach is quite adamant in her warnings against the use of the space syntax method for analytical purposes[234]. Social anthropology had been 'borrowing' this method long before it was introduced into archaeology, for example to make models in kinship studies. She explains that experience has taught that the whole exercise can easily become analytically worthless. As soon as the model building turns into formal mathematics it fails to take into account the complexities of the real situation. Basically, Leach says, the chasm between basic space syntax and real life sociology is much wider than Hillier and Hanson appear to suppose.

Martin Watts' approach to Roman houses, based on the concept of pattern language, allowed her to recognise three types of space based on the circulation of people into or through them. *Centres* are spaces which people pass through and which serve as nodes for a group of other spaces, *connectors* are corridor-like spaces which connect other spaces, and *static spaces* are rooms where people would normally stay for extended periods of time. These three types of spaces were differentiated by painting and pavement treatment, as well as by spatial configuration. Their location, size, decoration and relation to other spaces created a hierarchy of dominant and subordinate spaces. This hierarchy is closely related to what Martin Watts described as one of the most important ordering principals in atrium houses: *axial order*. The organisation of the atrium house around one or more axes is a commonly recognised and much studied phenomenon[235]. Scholars agree that the central axis of the house, or 'deep view', was of major importance. It allowed the visitor a glimpse through the sequence of fauces, atrium and tablinum, and further into the garden at the back, where the view would preferably culminate in an eye catching feature such as a painted niche or statue[236]. Apart from the central axis, a house would often also contain one or more cross-axes, running for example from the position on a couch in a dining room across and into the peristyle-garden. Martin Watts further emphasised the vertical axes that are commonly present in Roman houses, such as that running through an unroofed courtyard or the opening of the compluvium. She explains that the vertical axis, connecting the earth with the sky and man with the heavens, was probably the most important symbolically[237]. Amongst the basic ordering principals of the house, she also draws attention to two features that are difficult to recognise and reconstruct today, but played a role in the experience of architecture in antiquity: the variety of light levels and ceiling height variety. These factors too helped create a hierarchy of spaces. Dark areas were necessary to make light ones apparent by contrast.

---

234 Leach 1978, 385-401.
235 Two studies in particular focussed on axiality in the Roman house: Drerup 1959, 147-174 and Bek 1980.
236 The meaning of the axial view will be further analysed below.
237 *De architectura* VI, 3; Martin Watts 1987, 107.

The largest and most important spaces tended to be the tallest, whereas the more insignificant rooms had low ceilings[238].

The two studies described above were concerned with an analysis of the architectural order of the houses, and recognising the social patterns in the spatial configuration. The danger in both approaches lies in the fact that they use a method, which was originally intended as an aid in the design process of new structures, as an analytical tool for archaeological structures. The biggest concerns regarding Grahame's space syntax were already discussed. As far as Martin Watts is concerned, I feel that her approach has been of more value. With her PhD thesis dating to 1987, she was one of the first researchers that emphasised particular elements in the layout and build-up of atrium houses, which have since then been paid much more attention to and have subsequently become widely accepted and described. In her description of the 'deep view', the cross axes and the vertical axes in particular, she took the step of assigning a social and symbolic meaning to the architecture of the house. Other elements too, such as the different light levels and ceiling heights, were justly cited by her as integral parts of the experience of architecture.

As was mentioned, there are also other, non-structural elements that acted as 'social guides' for visitors. Wallace-Hadrill convincingly demonstrated that the public-private differentiation was probably the most important factor in the social structures and patterns defining the atrium-peristyle house. According to him, the distinction between public and private was most powerfully put across by the technique of *allusion*. Architectural or decorative features were borrowed from the public world and introduced into the private sphere in order to communicate a certain message. The use of allusion is intrinsically connected to the process of Hellenization, where Greek public forms were introduced by the Romans in the domestic context. One example of such a form was a triangular pediment, an architectural element that could be used to give extra importance to a room[239]. This was a feature normally used in Hellenistic palaces and can therefore be considered as a marker of high status architecture. Another borrowed element of Greek public architecture, which is so commonly found in Pompeian domestic architecture that it would almost appear original to it, is the column. The effect of columns, which were most frequently used in peristyles and atria, is that they add a feeling of prestige to a space[240]. Furthermore, there is evidence to suggest that the different orders (Doric, Ionic, Corinthian) were consciously applied in (pre) Roman domestic architecture. From a sample of thirty-three Pompeian atrium-peristyle houses, Frederique Schipper concluded that the function of a room in relation to its position in the house influenced the use of the orders[241]. This resulted in a hierarchy that manifested

---

238 Ibidem, 137-147.

239 A good example is present in the large triclinium on the east side of the peristyle of the Casa del Menandro (I 10, 4).

240 Wallace-Hadrill 1994, 17-22; Dickmann (1999: 47) voices some doubts regarding this matter, as he feels that the use of columns was so widespread from the middle of the second century BC onwards that the power of allusion may not have been present anymore in later columns, for example those in Second Style decorations.

241 Schipper 1992, 127-149.

itself along two lines within the houses: one line from the front to the rear and another from upstairs to downstairs.

The final element in the 'language' of the house that I will mention here is the decoration of floors, walls and ceilings, which was also a powerful tool in getting across the right message to those using and visiting the house. Again, the language of public and private formed an essential element and here too, the technique of allusion played a major role by using elements from the public world to evoke certain associations[242]. Similar to the power of the spatial order of the house and the use of architectural elements borrowed from public space, decoration could create a sense of hierarchy between the different rooms, helping to steer the visitor through the house. In the use of decoration, Wallace-Hadrill recognised three spectra in particular that had the power to generate hierarchies: colour, motif and framework. Some colours were not as readily available as others, making them more precious and more expensive. The choice to use a particularly precious colour on the wall could thus bestow prestige on a room. The selection of certain motifs could also have this effect: heroic and divine scenes in particular were considered prestigious. Most important, however, was the use of frameworks to create divisions on the walls and add structure to them. Not only did they frame the decorative space in the room, they had the added power of actually framing the social space of the room[243]. The selection of the use of particular colours, motifs and frameworks in the different rooms throughout the house thus led to a decorative framework with a clear hierarchical order. Furthermore, the choice for a certain type of decoration was also related to the type of space it adorned. Dynamic, or walking spaces, which people had to pass through to reach their end goal, were usually decorated with easily recognisable, simple patterns. Static, or resting spaces, on the contrary, tended to have more complex decoration requiring the viewer's prolonged attention[244]. The coordination of wall, floor and ceiling decoration could even be used to create a functional division between areas within one room. In dining rooms, for example, decoration was frequently adjusted to differentiate the static space for the dining couches from the dynamic area for the servers[245].

Changing dynamics: the addition of the peristyle-garden

The introduction of the peristyle-garden, an element foreign to the indigenous atrium house form, brought about a number of significant changes in the underlying patterns and social structures of space. The acceptance of this new architectural form, not just by the elite but also by society at large, took place from the early second century BC onwards. This was a time of change in general for Pompeii, which, under the direct influence of Rome, became part of a wide Mediterranean trade network, including the eastern Mediterranean. As Pompeii prospered, the elite was keen to show off their newly acquired knowledge of the

---

[242] Wallace-Hadrill 1994, 25.
[243] Wallace-Hadrill 1994, 31-37.
[244] Clarke 1991, 16-17; 2007, 323.
[245] Clarke 2007, 326-327.

Hellenistic world in particular, and one way to flaunt their cultivation was through the decoration of their homes. In this process of Hellenization, the Pompeian elite adopted the luxury of the Hellenistic world on a truly princely scale[246]. Hellenistic symbols were used, for example, in figured capitals (usually Dionysiac in theme) adorning the entrance to a house, but were also abundantly present in other decorative forms such as stucco, mosaics and statuettes. The addition of the peristyle-garden to the atrium house was perhaps the most invasive of the newly introduced Hellenistic features, creating a major transformation in the experience of domestic architecture.

The introduction and development of the peristyle in Pompeii was most extensively studied by Jens-Arne Dickmann[247]. To get an idea of the Pompeians' original intentions when introducing the peristyle-garden to their houses, he analysed four properties with an early, second century peristyle, that did not suffer from any restrictions in space and could therefore have the peristyle design executed exactly as intended[248]. The most notable feature in these early examples was the disproportion between the large dimensions of the garden-area and the scarcity of rooms opening onto them. In all four cases, the peristyle-garden was flanked only by a single room with a large opening (which Dickmann terms *exedra*). Apparently, these early peristyles did not function as large-scale reception areas, but as real ambulatories, which, combined with the presence of an exedra, present a close parallel to the Hellenistic *gymnasium*, a type of building that served educational purposes in the Greek world. Dickmann thus proposes that the Pompeian peristyle-gardens were inspired by Hellenistic public architecture rather than by Hellenistic houses or palatial structures, where columned courtyards typically formed the centre of the domestic organisation. In Pompeii, on the other hand, the peristyle was an addition to the already existing circulation patterns of traditional domestic architecture[249]. According to Dickmann, the peristyle was originally introduced in the Pompeian house as a sign of *paideia*, education and culture in the Greek style[250].

The original function of the peristyle as an *ambulatio*, a shady place to stroll around in with guests or friends, already started to change at the end of the second and definitely in the first century BC, when the main living area of the house moved from its traditional position in the atrium to the peristyle[251]. This shift is clearly visible in the layout of many Pompeian houses, where the orientation of the tablinum and triclinia, situated in the zone between the atrium house and peristyle-garden, moved. Whereas before, these spaces where orientated towards the atrium, the openings on this side were now decreased or even closed-off. At the same time, the openings towards the peristyle-garden were widened and all the spaces around

---

246 See Zanker 1998, 35-41.
247 Dickmann 1997, 121-136; 1999, 127-158.
248 These houses are the Casa del Fauno (VI 12, 2-5), the Casa del Granduca (VII 4, 56), the Casa di Arianna (VII 4, 31.51) and the Casa del Citarista (I 4, 5).
249 Cfr. Evans, who also suggested that the Pompeian peristyle was a development of the old hortus under influence of Hellenistic public architecture (1980, 226-227).
250 Dickmann 1997, 127.
251 Ibidem, 121-136.

the garden were richly decorated in the latest fashion of floor and wall decorations. In the new situation, access to the garden-area was mainly through corridors or the tablinum. The use of folding doors at the back of the tablinum offered the homeowner control over how the house was experienced. When closed, the tablinum was kept as part of the traditional atrium configuration, but when opened up, it was transformed into a kind of vestibule, leading visitors into the garden behind[252].

Concluding his study, Dickmann emphasises that no serious attempt was made in Pompeii to integrate the peristyle into the construction of the traditional atrium, such as we know for example from houses on Delos, where the peristyle functioned as the core space of the house. Rather, the newly appropriated element was used to create an area apart, separated from the rest of the house. He proposes that this manifest lack of interest in spatial integration can be related to the differentiated social etiquette of the strictly hierarchical Pompeian society. Wallace-Hadrill further expands on this idea[253]. In particular, he regards how the addition of a secondary nucleus to the house allowed more complex hierarchical relations to be created, with different levels of privilege. The elite took clever advantage of the introduction of this foreign element into the indigenous private architecture. With the appropriation of this exotic feature, new social dynamics were created in the existing house structure. In a society where power was for a large part dependant on social standing, and where public life took place in the private sphere, the addition of a second living-area to the house was quickly used to its full advantage. It opened up new possibilities of differentiation within the house, ranging from the more public activities for the larger public (such as the *salutatio* in the atrium-alae-tablinum range) to more private affairs between the house owner and his peer group and inner circle. Dependent on what social group a visitor belonged to, certain areas of the house could or could not be entered. Furthermore, the introduction of the peristyle would have had the effect of changing the symbolic function of the atrium. Positioned at the back of the visual axis that runs through the house, the peristyle, with its luscious appearance and bathing in sunlight, was visually more desirable than the roofed and rather dark atrium. Underlining the exotic and imported features of the peristyle had the effect, by contrast, of accentuating the atrium as a traditional Italic element[254].

The introduction of the peristyle-garden in the Italic atrium house must have been instigated by the elite, who were in a position where they could afford such an extensive building project, and, more importantly, who were keen to use this newly appropriated feature as a way to distinguish themselves from the rest. However, as with all luxury goods

---

252 Dickmann 1999, 158; contra Evans, who describes a development of tablina being closed off at the back from the second century onwards. She interprets this phenomenon as related to the greater formal development of the peristyle, which might have brought about a need to define the tablinum more closely as part of the atrium complex (1980, 93-94).

253 Wallace-Hadrill 1997, 239-240; see also Van Krimpen-Winckel 2006, 160.

254 These topics, of the traditional value of the atrium and the particular relation between atrium and peristyle will be further examined in the discussion of the metrological results of the present research, in part 2 of this chapter.

adopted by the elite as status symbols, the people were quick to follow[255]. Clearly, the majority of the Pompeian homeowners were not in such a privileged position that they could add a full four-sided peristyle at the back of their property. In reality, a wide range of different solutions was invented to fit each individual situation, resulting in all kinds of adaptations that were usually aimed at creating the illusion of a perfect four-sided peristyle. In many cases, only two or three porticoes were fitted into the existing garden-area at the back of a house, with the remaining sides present only in the form of stucco decorations, or as engaged columns in the garden sidewalls. The addition of the peristyle-garden to a property was highly appreciated and desirable, as is well attested by the number of homeowners that purchased extra land – and thereby inevitably sacrificed the properties of others surrounding them – in order to fit a full peristyle at the back of their original house. These phenomena and the relation between the atrium and peristyle will be discussed in detail in the presentation of the metrological analyses below. Also, the interpretation of the total lack of spatial integration between atrium and peristyle, first suggested by Dickmann and further elaborated by Wallace-Hadrill, will be partially invalidated by the metrological results of this study.

Professional building: theory and practice

Although the current research does not include a proper theoretical-anthropological framework, I will present some elements of the anthropological study of building traditions and practices in rural Sardinia by Murru Corriga[256] here, because they are especially informative and have the power to give us some idea of 'the human factor' in the design and construction process. Furthermore, her research creates a clear picture of the role of society in the existence and changes of a building tradition, aspects that can never be fully understood through archaeological research alone[257]. The choice to present this particular study in the context of the current research is based on the fact that Murru Corriga's findings offer a number of suggestions that may give us more awareness in recognising some aspects of the building tradition and practice of atrium-peristyle houses in Pompeii. Her particular interest lies in the building tradition of local houses, which was entirely in the hands of professional masons until the period after the Second World War. Despite the fact that this study is not concerned with real architects, there are several remarkable similarities between the Sardinian building tradition and what we know of the tradition represented by Vitruvius on the one hand and the Pompeian building tradition on the other. Before clarifying the

---

255 On luxury as a social process see Wallace-Hadrill 1994, 143 ff.; on the construction of pseudo-peristyles in Pompeian houses see Dickmann 1999, 135-139; on the introduction of architectural innovations by the elite see also the anthropological research by Gianetta Murru Corriga described below under 'professional building: theory and practice'.

256 Murru Corriga 1994, 41-68.

257 I would like to express my sincere gratitude to Prof.ssa Gianetta Murru Corriga for her help by inviting me to the Facoltà di Lettere e Filosofia at the Università di Cagliari, as well as for her visit to Pompeii during one of our fieldwork campaigns.

relevance of this study to the situation in Pompeii, I will present the study by Murru Corriga by focussing on three relevant topics, the professional education and practice of the 'architect', the process of design and construction and the introduction of architectural innovations.

As was mentioned, the construction of local houses in Sardinia was entirely in the hands of professional masons until the second half of the twentieth century. From her interviews with the older masons, Murru Corriga learned that their responsibilities included a wide range of tasks spanning from the original design to overseeing the construction, picking out the building materials, choosing the right orientation for the house, acting as a legal counsellor where necessary, and everything in between. The entire project rested in the hands of one man, who clearly had to be skilled in a range of professions besides that of manual labour. In order to acquire the necessary knowledge and skill to perform these tasks, a mason's career started as an apprentice under the guidance of a master in the profession. During the course of several years, he was taught specialised empirical knowledge, while at the same time gaining direct practical experience by traversing a personal road of working on different projects. This combination of theoretical and practical knowledge and experience together ensured the training of a qualified professional.

The process of design and construction of a house is another potentially valuable topic of Murru Corriga's study. It highlights the roles that were played by the different parties in this process, in this case the mason/builder and the client, as well as their relation to each other. Furthermore, we get a sense of how the particular form of a house type is fixed in the rules of society, which were dictated by the possibilities and limitations that arose from the precise local conditions. In traditional Sardinia, the construction of a house was based upon models, forms and structures that had already been tried and accepted. Building a house meant in fact building a 'model' of a house, which was known and appreciated by society as it was characterised by functional and aesthetical elements that had largely been elaborated within and by that society. This model was the result of the work and experience of several generations of professional tradesmen and their direct collaboration with the craftsmen that handled the building materials on the one hand, and those who were living in the houses (the clients) on the other hand. From the outset, both the professional builder and the client knew the type and the form of the house, and the construction was basically the adaptation of the model. This process started with the two parties discussing the general lines, based on the principles that were applicable to any construction. Successively, the details were elaborated and the adaptations to the given form were discussed, taking into account the particular situation at the building site and the available means. Once the builder and his client had reached an agreement on the design, the building materials and the price, the construction could commence.

The builder's first priority on site was choosing the right orientation for the house. Preferably, in the study at hand, the house was directed towards the sea, ensuring the maximum amount of sun exposure, which was considered important both for the health of the house – which remained dryer - and of its inhabitants. Clearly, this tradition had a

rational basis in the empirical experience of the local people, who in the course of time had found cultural solutions to specific climatological and environmental conditions. The addition of the *lolla* (porticus) to the house, allowing the penetration of sunrays during winter, but also shielding the house from them during summer, was the ultimate improvement of a technical-cultural solution to natural circumstances.

The actual construction started with laying out the external and internal walls on the building site by using stakes and rope. This was always done in the same order, starting with the kitchen in one corner. The measurements of the different rooms and of the *lolla* were more or less predetermined, as they were conditioned by the measurements of the wood that was used in the roof construction. The opening to each space was also predetermined, based on the availability and disposition of the furniture, which was fixed according to traditional canons and deep-rooted beliefs.

The introduction of innovations to the fixed form of a traditional house, based on generations of experience and cultural-technical solutions to local circumstances, could only take place under particular circumstances. From Murru Corriga's research we know that, at least in the case of Sardinia, technical innovations were normally introduced through the wealthier houses. For these innovations in the rich houses not to remain simply isolated examples of elite architecture, but to serve as a powerful model for the entire community, it was necessary for the community itself to be in a state of general economical and social change, which brings about the leaving behind of a total system of values, including those values that are reflected in the conception and construction of the house. In the recent history of the island, there were two periods in particular that saw considerable changes in the traditional house architecture. According to the oldest masons, the participation of local tradesmen in the building activities of military structures in Libya and the construction of the mining city of Carbonia, both wanted by the fascist regime in the period between the two World Wars, played an important role in the direct influence on the training of the labourers and in the introduction of new ideas and building techniques. The technical-cultural changes in this period left considerable traces in the architecture of the Sardinian villages, most noticeable in the progressive development of several house types. An even more radical period of change took place in the decennia after World War II, an event that brought about a strong acceleration in the processes of material and social transformations, of the 'modernisation' that had already started in the period between the wars. The economical and social changes led to a change in people's demands for living and the ideology of living, encouraging the departure from local traditions in favour of external models of house architecture. Simultaneous to the changes in form and structure of the house, the materials and techniques that were applied for the construction also changed radically, and with them the entire system of empirical knowledge.

The relevance of Murru Corriga's findings to the study of Pompeian atrium-peristyle houses lies in the three topics presented above. They offer useful suggestions as to how the building practice of atrium-peristyle houses in Pompeii may have functioned. Firstly, we find

noticeable similarities between Murru Corriga's description of the multiple tasks that mason-builders were expected to carry out during the process of design and construction and Vitruvius' extensive summing up (Book I, 1) of the wide variety of skills that an ancient architect had to acquire in order to perform to the expected standard. Both writers refer to the fact that they even had to act as legal counsellor if necessary, for example in a dispute with a neighbour about the ownership of a shared wall. Furthermore, the long trajectory they had to undertake to master their skills was also very similar. In both cases, the young mason or architect started out as an apprentice of an experienced teacher who taught them the necessary theoretical knowledge, while at the same time gaining practical experience by working on different projects. Even though Vitruvius intends to present us with genuine architects, whereas the Sardinian responsibles were only trained masons, their role in the entire construction process and the basis of their education were not that different. In fact, the professional tradesmen that were at work in Pompeii may have been more like those trained Sardinian masons than the Vitruvian architects, less specialised perhaps but certainly capable of performing to a high standard.

The similarities between traditional Sardinia and ancient Pompeii are not only visible in the 'architect's' education and practice, but also in the ways in which a community's building traditions are defined by the rules of its culture and based on the repetition and adjustment of architectural models that are common good (such as the model of the atrium house). A tradition comes into existence because it is caused by a particular set of environmental and climatological conditions, for which the population invents, over time, a number of technical and cultural solutions. Over time, the model for a certain house type is perfected and becomes an integral part of a community's building traditions. As a consequence, the architect/builder who was commissioned with the design of a particular house type did not enjoy unlimited creative freedom, and his challenge was to try and create a personalised design within the set framework of rules. As far as the actual construction process of these houses is concerned, we can also find similarities between the Sardinian tradition and that discussed by Vitruvius and reconstructed in this research for ancient Pompeii. Murru Corriga's study forms a good illustration of how this process actually evolved in practice. Working with a known model of a house, the process was initiated by a discussion between the client and the builder on the general lines of the design, which both were familiar with from the outset (*ordinatio*). Successively, the details of the particular building project at hand were decided and adjustments were made where necessary to the particular practical, economical and social demands (*dispositio* and *distributio*).

Another common aspect between traditional Sardinia and ancient Pompeii that will be further discussed below, is the way that the introduction of technical and aesthetical innovations take place through the wealthier houses, i.e. the atrium-peristyle houses. For these innovations, such as the introduction of external models of house architecture, to be accepted by a society, it needs to be in a phase of social and economical change, such as the period between the two World Wars and that immediately after the Second World War in Sardinia. A comparable period in Pompeii's history comprises the third and second centuries

BC, when the provincial town came under the influence of Rome. As a result, Pompeii became part of the wider Roman trade network and the Hellenistic Mediterranean world. The small provincial town subsequently flourished, both economically and socially. It was in this period that wealthy Pompeian houses appropriated new elements of Hellenistic architecture, with the peristyle as the best-known example[258].

NEW PERSPECTIVES THROUGH METROLOGY

In the above-mentioned studies, one topic has remained, remarkably enough, absent: the *design*. There is plenty of discussion on the plans and layouts of houses and the relationships between the different spaces, but never on the originating process or the choices and considerations that played a role therein. As Vitruvius informs us, the process of designing a private structure was conditioned by a number of 'social' factors, alongside the practical and economical conditions. In a competitive society such as Pompeii, the need for wealthy businessmen and politicians to own a house that was fitting for their particular social status was of crucial importance. It formed the setting against which they performed their act, receiving their dependants during the morning and entertaining their peers at night.

Contrary to the different types of studies described above, which are mostly concerned with the client's perspective, the angle of research presented here deals with the technical level of tradesmanship and is thus concerned with the relationship between the architect and his client. The focus here is on the process of design, the mathematical system of measurements, the relationship between the different elements that make up the house, and particularly the signs of architectural skill that make the house unique and create the desired look and feel of the place. One example of such an architectural trait is the line of sight through a house, carefully laid out to guide the visitor's eye to selected viewpoints, often creating a pleasant picture of symmetry. The elements that together make up the process of constructing a house, namely the design, the trade and the project development, are the architectural means that lead to and are secondary to the end goal. The desired end-result was a house that reflected and improved the social standing of its owner and that, in its complete picture of layout, elevations and decorations would leave no doubt to the eyes of anyone entering it. In other words, a perfect harmony of all elements, which Vitruvius calls *eurythmia*[259].

Methodological premises and considerations

In order to understand the social concepts that played a role in the process of development of a building, from the initial conception of a design, through its consequent

---

[258] Zanker 1998, 32-34.
[259] A detailed analysis of the different terms used by Vitruvius is presented in Chapter 2.

adjustments and finally the actual construction, as well as in uncovering the social meaning that was embedded within that design, I have applied the following premises[260]:

1. A metrological analysis of the principal measures of the original layout of a house can lead to the recognition of the invisible design that lies at the base of the built structures that we see today.
2. The characteristics of the design, which can be expressed as a two- or three-dimensional scheme, are not just random choices but belong to an architectural tradition.
3. The design of a house is a way of expressing and emphasising certain spatial and social effects and is 'physically' present for a certain amount of time, during the process leading up to the final construction of a building on site.
4. With the construction completed and the built structure displaying the desired result, the design was soon forgotten. However, prior to the actual construction existed a phase of negotiations between the owner and city administration over the purchase of a suitable plot of land and after that, a phase of negotiations between the owner and the architect regarding the details of the new house.
5. During this pre-construction process the design plays an active role and holds within it a clear social function, which is at that time determined and adjusted to each specific situation. As Wilson-Jones puts it: 'design is not a static entity, it is a process of dynamic interaction between concept and contingency, between the generic and specific and evolves progressively as multiple individual decisions are assimilated into the whole'[261].

To my opinion, one of the great advantages of the research method used here – the metrological analysis – is that it deals directly with the subject matter, in this case the material remains of the house. The information that is necessary to make a metrological analysis – detailed measurements of the building in combination with a reconstruction of its building history by analysis of the wall structures – is all found in the material remains, without using secondary sources of information. Clearly, the interpretation of the outcome of the metrological analysis, in terms of the meaning of a particular design, whether practically, economically or socially, can only be made in coherence with the information we have from the other, above-mentioned studies that also deal with private architecture. However, the research method applied here is focussed on the heart of a built structure, as it was originally conceived and constructed over two millennia ago. In that perspective, the metrological analysis offers a unique and 'true' glimpse of the past.

All conclusions and suggestions presented here are the direct result of the metrological analyses of the eighteen atrium-peristyle houses that form the database for this research.

---

[260] Compare Van Krimpen-Winckel 2006, 157.
[261] Wilson Jones 2000, 49.

The traditional and social value of the atrium house

The atrium house, indigenous to the Italian peninsula, was a house type with an exceptionally long and widespread tradition of use. Contrary to earlier reconstructions of one typical atrium house as the 'ideal' Roman house – especially in the early 20th century – new and more extensive research has revealed that this type of house, constructed around a central court with the other rooms focussed towards this court, existed in many shapes and forms. In fact, it covers a wide variety ranging from smaller and more basic plans to extremely large and extravagant examples[262].

However, in the sample of eighteen houses in this research, all relatively spacious and well-to-do houses that belonged to the elite of the town, there are clear resemblances in the build-up of the atrium houses. Despite differences in grandeur and plot dimensions, each house has a plan with a central court surrounded by rooms on both sides, as well as at the front and back[263]. The exact layout of the individual rooms around the court was variable, but the overall build-up was always recognizable as part of the same tradition. Particularly noteworthy is the fact that, during their history of use, the layout of the atrium in all these houses – a reflection of the original design – was never altered in such a way that the original plan and dimensions were compromised[264]. What makes this aspect so remarkable is that these houses each had a long history of use (presumably at least two centuries), in which they underwent several phases of changes and/or reconstructions. Some houses saw a change in function, whereby the entire property or part of it became the centre of commercial or industrial rather than residential activity[265]. In the total sample of eighteen atrium-peristyle complexes, fourteen original atrium houses were transformed by the addition of a peristyle-garden, an architectural change with far-reaching consequences for the use and functions of the atrium[266]. In some cases, such as the Casa di Philippus (VI 13, 2) and the Casa di M. Terentius Eudoxus (VI 13, 6), the atrium houses were first altered by the addition of peristyle-gardens, which were then, at a later date, transformed into workplaces. In other cases, houses needed to be rebuilt extensively, such as the Casa di L. Caecilius Iucundus (V 1, 26) after the earthquake of AD 62, or house VI 13, 13. The newly built walls of these properties were, however, erected in exactly the same position as the old ones, following the original lines of the design.

Clearly, during their extended and multi-faceted history of use, the functions of the different spaces within the atrium houses must have changed at least in some ways. We may

---

262 The development of the atrium house and the most current ideas on this topic are discussed in Chapter IV.
263 With the exception of the Casa della Calce (VIII 5, 28), which has no back range in the situation of AD 79.
264 This is a phenomenon that is also present in many other, comparable atrium houses in Pompeii; see also Dickmann 1999, 104.
265 For example the Casa di M. Terentius Eudoxus (VI 13, 6), where the peristyle-garden was converted into a '*officina textoria*', a workshop for the spinning and weaving for the production of wool.
266 The analysis of the wall structures of the eighteen houses revealed that four houses were constructed as atrium-peristyle houses originally, whereas the remaining fourteen were originally atrium houses with some type of garden at the back, which were later expanded by the addition of a peristyle-garden.

even imagine that it was desirable at some time, from a practical point of view on the use of space, to introduce structural changes to the layout of the house. However, the evidence of the built structures tells a different story. It appears that the highly ritualised model of the atrium house was consciously held onto by the people of Pompeii as part of their own heritage in an age, where, under the influence of Rome, new Hellenistic building elements were accepted in private architecture. The original form of the atrium house, guided by strict rules of design, was never given up, even when its function changed over time as the peristyle was incorporated into the house structure and took over some of the old functions of the atrium. This typical house form that was part of the heritage of the Pompeian elite seems to have carried in it such a heavy load of social codes and values that we may say that tradition prevailed over practice[267]. I must thereby object to Dwyer's' statement that: "Owners and architects in early imperial Pompeii were obliged to adapt architectural form to the quotidian rituals of wealthy Roman patrons: theory aside, practice prevailed." (Dwyer 1991, 39). The Pompeian evidence clearly contradicts this statement, with many of the old atrium houses dating back to the pre-Roman period actually retaining their original form. In my opinion, the argument should be reversed: within the existing house form, an extensive canon of rituals grew over the generations and became an integral part of the atrium house architecture, the two being intrinsically connected, thereby rendering major adaptations to suit the Roman patrons unnecessary. The origins of these unchanged patterns may be found in the general perception of the house as a micro-cosmos, reflecting the Roman's understanding of the world and man's place in it. Regarded in that way, aspects of the atrium house such as the strong hierarchy and centrality may have had a strong symbolic content as reflexions of particular aspects in Roman society. If the patterns of the house were indeed based on such deep-rooted sentiments, this may explain why they remained relatively constant, even with changes in life-style[268].

The historical depth of the ritualised atrium form becomes particularly apparent through the combined study of the construction history and the metrological analysis of these houses. In the case of the Pompeian houses, the atrium model survived centuries of different owners, changes in function as well as in fashion. Clearly, the tenacity of the atrium-model must have been intrinsically connected to the way in which the house functioned, and thus the way society functioned at large. We know that the house played an active part in the representation of its owner's status, in the sense that it functioned as a semi-public place where peers, business relations and clients were received. In this well-defined hierarchical order, where strict rules and guidelines were essential in the everyday functioning of all people, from peasant-clients to influential politicians and everything in between, the layout of the atrium house formed an important background setting that was familiar and understandable to all. A phenomenon of this nature, so wholly engrained in the traditions of

---

[267] Van Krimpen-Winckel 2006, 161; see also Wallace-Hadrill 2007, 287-288.
[268] Martin Watts 1987, 365.

a society, did not disappear overnight. Even when the traditional functions of the atrium were (partially) taken over by the peristyle-garden, and there were neither practical nor ritual reasons to hold onto the strict lines of the original atrium design, the people of Pompeii did in fact do so for over a century.

The adaptability of the atrium form may be the reason for its persistence. The abrupt ending to this tradition was finally caused by the eruption of the Vesuvius, but did not appear to be going out of fashion yet[269].

The addition of the peristyle-garden

In this context of traditional architecture, the most radical change has been the addition of the peristyle-garden. We know that the introduction of the peristyle took place at a relatively late date, starting in the second century BC. The research by Dickmann in particular has shed light on the development of the peristyle-garden as a foreign element in the indigenous Italic house architecture. Dickmann explains how the peristyle was already starting to take over the original function of the atrium house by the beginning of the first century BC. One of the phenomena related to this general change that he mentions is clearly visible in the current sample of houses. The shift of attention from the atrium to the peristyle is most apparent in the orientation of the rooms in the atrium back range, i.e. the rooms situated in between the atrium and peristyle with the tablinum as the central space. In some cases, the analysis of the wall structures clearly reveals that the orientation of these rooms was turned around from being directed towards the atrium to being directed towards the peristyle-garden. On the atrium side, the original entrances to these spaces were closed off or reduced to a narrow passage, while the peristyle side of the rooms was opened up[270]. Clearly, the addition of the peristyle to the atrium house had a considerable impact on the structural appearance of the house, as well as on the way that it was and could be used.

In the context of the method of research presented here, several questions are of particular interest, focussed specifically on the relationship between the atrium and the peristyle-garden. Of the total sample of eighteen, how many houses were originally constructed as atrium-peristyle houses and how many were originally atrium houses that had a peristyle-garden added at a later date? What can we say about the spatial integration between the atrium house and the peristyle-garden? And, more in general, how did the appropriation of this new element take place within the context of Pompeian society?

The appropriation of a new, foreign architectural element in the indigenous tradition of private architecture is a process that takes place under particular circumstances in a society. Typically, these kinds of processes are difficult if not impossible to reconstruct through archaeological research alone, and here, the anthropological research by Murru-Corriga may

---

269 Wallace-Hadrill 2007, 289.

270 Examples of such changes can be seen in the following houses of the sample: the Casa del Torello (V 1, 7), the Casa di L. Caecilius Iucundus (V 1, 26) and the Casa del Principe di Montenegro (VII Ins. Occ., 12-15).

help to give us some idea of how this process took place. She describes how the introduction of a foreign element in house architecture in traditional Sardinia took place through the elite, who were the first to adopt new models. After a while, other members of society would start to copy this new feature, until it was accepted by society at large and became an integral part of the new generation of private architecture. This process of emulation is also well known from Roman society, where the material culture and lifestyle of the elite were constantly being copied by those envying their success[271]. It is this process that lies behind the spread of new elements through all social ranks. The sample of eighteen elite houses thus provides us with an excellent tool to study this phenomenon. The combination of the information we have from the metrological analysis with the information on the building history of each of these properties – particularly the relation between the atrium and the peristyle – can provide us with information on the process of the appropriation of the peristyle in Pompeii. A comparison between the different properties tells us about the choices that were made by the architect and proprietor, and they could afford to make. To make this comparison, the following aspects of each of the houses are compared
(see Appendix: Table 1):

1. Total area of the atrium-peristyle house.
2. Area of the atrium house.
3. Area of the peristyle-garden.
4. Orientation of the peristyle: longitudinal or transversal.
5. Building history of the atrium-peristyle house: constructed in one phase, constructed in two phases on the original plot or constructed in two phases after the acquisition of new land.

The introduction of the new architectural feature of the peristyle immediately posed a problem. How to fit the peristyle-garden into the existing maze of plots in the crowded city centre? Only a few lucky homeowners were in a position that allowed them to initially purchase a plot big enough to construct an atrium-peristyle property in one building project. What were the solutions created for the rest, who already had an atrium house constructed and later wanted to follow fashion by adding a peristyle?

1. ORIGINAL ATRIUM-PERISTYLE HOUSES

In the total sample of eighteen houses (see Appendix: Chart 1), only four atrium-peristyle houses were constructed in one building project: the Casa di Pansa (VI 6, 1), the Casa dei Capitelli Figurati (VII 4, 57), the Casa del Principe di Montenegro (VII Ins. Occ., 12-15) and the Casa del Cinghiale (VIII 3, 8). Three of these properties were situated in the heart of the city centre. Their owners must have been in a privileged position, as they could afford to

[271] Wallace-Hadrill 1994, 186.

purchase a plot that offered enough space for the construction of an atrium house with a longitudinal peristyle at the back. In the case of the Casa di Pansa, where the owner of the house was in fact the owner of the entire insula VI 6[272], it is not surprising that ample space was reserved for a residential complex at the centre of the insula. In the process of the design and construction of this house, the area that was reserved for the peristyle-garden with a large reception/dining space at the back was almost 1½ times the area used for the atrium house. The owner of this house and insula, clearly a man of great means, apparently fully embraced the innovative architecture of the fashionable peristyle by placing the emphasis on this part of the house from its first conception. Still, the atrium house was constructed according to the strict guidelines that were part of its building tradition.

The two other original atrium-peristyle properties that were situated in the city centre were both constructed on the same, basic concept. The total plot of land, rather narrow and long in shape (Casa dei Capitelli Figurati: 60' x 175'; Casa del Cinghiale: 75' x 180') was divided into two equal areas for the design and construction of the atrium and peristyle. On a more detailed level of design too, both properties were the product of one coherent and symmetrical design, with the atrium and peristyle as part of one general concept.

The fourth property that was originally constructed as an atrium-peristyle house is situated in a unique spot just outside the city centre. Southwest of the Altstadt, the Casa del Principe di Montenegro was built on the edge of a prehistoric lava flow, near the Porta Marina. Prior to the construction of several properties here, this area was used as a defensive zone, naturally suitable to this purpose due to the steep fall towards the west. Situated on the ledge, the houses here were constructed on different levels by creating terraces, offering what must have been stunning views onto the sea. Similar to what happened with the previous two houses, the total depth of the plot of land used for the construction of this house (154') was divided equally, into an area for the atrium house (77') and an area for the peristyle-garden followed by a series of spaces on a lower terrace (77'). Due to the terracing, the available space for the peristyle-garden was relatively shallow, forcing the architect to create a transversal peristyle behind the atrium house.

A noteworthy feature in these four properties, which were constructed and designed as atrium-peristyle houses, is the division of the available plot in three cases, into two equal parts for the construction of the atrium and peristyle areas of the house. The only exception was the Casa di Pansa, where the peristyle was much larger than the atrium. This property is, however, a unique example, as its design and layout form part of and are the result of the planning of an entire insula.

---

[272] For a detailed description of this insula, see Pirson 1997, 165-182.

2. ATRIUM HOUSES WITH A PERISTYLE ADDED IN A LATER PHASE

Chart 1 (see Appendix) clearly shows that the majority of homeowners (fourteen out of the total of eighteen) was not in the position where they could have an atrium-peristyle complex designed and constructed in one phase. In this group, two houses form an exception. They do not possess a peristyle-garden at the back of the atrium-house, but a single portico in front of a garden-area. In the Casa del Chirurgo (VI 1, 10), constructed on a relatively shallow plot, there was simply not enough space left at the back of the house to create a peristyle of any significant depth. Furthermore, the small garden had a highly irregular shape, caused by the general shape of insula VI 1, which rather resembles a pie slice. Instead of a real peristyle, a portico was constructed at the back of the house in the small walled-up garden. The Casa di M. Epidius Rufus (IX 1, 20) is a different case. Here, despite the ample space at the back of the atrium, the owner also preferred a single portico along the back of the house, followed by a deep garden on two levels. Here, the choice not to construct a peristyle was not forced by a lack of space but may have been caused by the presence of 16 imposing columns in the Corinthian atrium. The construction of a peristyle at the back would probably not have been of additional value to this property, possible only distracting from the impact of the atrium itself[273].

In the remaining group of twelve houses, we can differentiate between atrium houses that had a peristyle constructed on the original plot of land (five cases) and those that were extended by the purchase of an adjoining property, in order to create extra space for the construction of a peristyle (seven cases). Both scenarios are the result of a problem that was inherent to living in the crowded city: a lack of space. Even though a reasonable number of house owners managed to acquire extra land to expand their property, this always happened at the cost of a neighbouring property and often resulted in plots that were irregular in shape[274]. In those cases, it was up to the architect to create a design that gave the visitor to the property at least the impression of symmetry.

A matter of interest in this context of urban space is the orientation of the peristyle behind the atrium house, which could be either longitudinal or transversal. Comparing the data from Chart 1 (see Appendix), we notice that in the total group of sixteen houses with a peristyle at the back[275], there are seven with a transversal peristyle and nine with a longitudinal peristyle. The real value of these statistics becomes clear when we consider them in relation to the areas of the atrium-peristyle houses as a whole and the areas of the individual gardens. The analysis of these data reveals a clear boundary that marks the transition between houses with a transversal peristyle and those with a longitudinal peristyle.

---

[273] The striking architecture of the Casa di M. Epidius Rufus, with its raised pavement and impressive Corinthian atrium, could possibly indicate that this structure was not used as a private residence, but had a public character instead, for example as the seat of some kind of professional association.

[274] Irregularly shaped plots in the sample caused by this phenomenon are: Casa del Menandro (I 10, 4), Casa di N. Popidius Priscus (VII 2, 20), Domus Cornelia (VIII 4, 15), Casa della Calce (VIII 5, 28) and Casa di M. Epidius Rufus (IX 1, 20).

[275] The Casa del Chirurgo and Casa di M. Epidius Rufus with only a single portico at the back are excluded.

Houses with a total available area less than 8000 *p.q.* had a transversal peristyle at the back, and those with a total available area larger than 8000 *p.q.* had a longitudinal peristyle. Furthermore, the first group all have a garden-area smaller than 4500 *p.q.* and the second group a garden-area larger than 4500 *p.q.* In the total group of sixteen houses with a peristyle at the back, there are two exceptions to this rule. The first is the Casa di N. Popidius Priscus (VII 2, 20), which had a total available area of almost 10.000 *p.q.* and a garden-area of almost 5000 *p.q.* Yet, it has a transversal peristyle-garden. Here, the shape and orientation of the garden was dictated by the geographical situation of insula VII 2. The Vico del Pannettiere, which runs along the north side of the insula with the entrance to the atrium house, is situated on a much higher level than the Via degli Augustali, which runs along the south side of the insula, where the peristyle-garden is located. Prior to the construction of this peristyle, there must have been another property behind the Casa di Popidius Priscus, built on the same level as the Via degli Augustali. However, when this property was added to that of Popidius Priscus, part of it had to be raised considerably to come to the level of the atrium house. A series of separate rooms was created behind this peristyle on the original, lower level. Consequently, there was not enough depth behind the atrium house to create a longitudinal peristyle, the only other option being to construct a transversal one. The second exception is the Casa di M. Obellius Firmus (IX 14, 2-4), which, with an exceptionally deep and wide garden-area was certainly spacious enough to construct a longitudinal peristyle. For reasons that remain unclear, a much less conventional solution was created here, in the form of an irregular three-sided peristyle placed transversally behind the double-atrium house.

Nonetheless, apart from these two exceptions, we can clearly recognise the boundary between houses with a transversal and those with a longitudinal peristyle to be set at an area of 8000 *p.q.* The choice for a particular shape and orientation of the peristyle-garden is thus based, it seems, purely on the availability of space or lack thereof[276]. Where there is adequate space, the peristyle is (almost) always longitudinal. This indicates that the longitudinal peristyle was the preferred type, whereas the transversal peristyle was more an adaptation to the limited space in the city centre. On an architectural design level, this preference for a longitudinal peristyle-garden is readily understandable. With the visual axis through a property as one of the strongest and most powerful characteristics present in the built structures, the longitudinal peristyle offered a much better perspective to elongate this axial view, and ultimately, to impress the viewer.

Tradition and practice of private architecture in Pompeii

Here, we will consider elements and questions regarding the practice and traditions of private architecture in Pompeii, that are directly related to the methods of research applied in this study, and are difficult if not impossible to answer from the viewpoints of other studies.

---

[276] See also Schoonhoven, who describes that the plot type, determined by its shape and size, is usually linked to the type of house that was subsequently built (2006, 169).

What can we say about the designs used in the construction of the atrium houses and peristyle-gardens? What does this imply about the professionalism of this trade and the traditions that had evolved over generations? But also: what can we infer from the metrological relationship between the atrium house and peristyle-garden? This last topic, on the spatial integration between atrium and peristyle, has also been the focus of other studies.

1. STANDARDS AND TRADITIONS IN THE DESIGNS OF THE ATRIUM HOUSES

Within the confined space of the city centre, the plots that were assigned to the construction of private architecture were often of a fairly standard shape and size, even though there are examples known where a private property owner purchased extra land to ensure the construction of his desired home. Clearly, those with enough money and power need not have complied with the general rules, and were in a position where they could commission an architect to design a house without being restricted by a lack of space or irregular plot. In the majority of cases, however, these were exactly the kind of restrictions that an architect or professional builder was dealing with when he was put in charge of the construction of a house.

In this context of building private architecture in an urban setting, it would be interesting to see if the atrium houses that were constructed on standardised plots, also follow standardised designs themselves. How much are they restricted by the size of the plot; did it leave hardly any free choice to the architect in the division of internal space, or can we still discern a certain level of freedom in the designs? Both Peterse and Geertman remarked in earlier studies[277] of the designs of Pompeian atrium houses that certain values frequently recur and particular spaces within the house were pretty much confined to set measurements with little variety: the depth of the alae had a standard measure of 12'-14' and the depth of the tablinum had a standard measure of 20'-21'. Peterse considers the existence of these recurring set measurements mainly to be the result of their primarily functional character, whereas Geertman proposes that they were the result of a combination of factors[278]:

a. The arithmetic factor. For the plots of these houses, a limited number of dimensions were available, which – from the geometric and arithmetic schemes – at their turn created a limited number of convenient measures.
b. The living conditions. The majority of subdivisions are related to elements that were bound to minimal or maximal sizes, conditioned by the demands of living.
c. The traditions of the trade. The two factors above together created a tradition of a limited number of constructive solutions. We can further add to these the availability of specific building materials, which also put restrictions on the dimensions of spaces[279].

---

[277] Geertman 1984a; Peterse 1984, 1993.
[278] Geertman 1984a, 50.
[279] The restrictive role of the building material, i.e. the lengths of the timber, also played a role in the traditional twentieth century construction of houses in Sardinia (supra n. 42).

2. 'TEXTBOOK DESIGNS' AND INDIVIDUAL SOLUTIONS FOR ATRIUM HOUSES BETWEEN 3500-5500 *P.Q.*

In the total group of eighteen houses, eleven atrium houses show evidence of having been designed to a standard 'textbook' model[280]. These eleven houses all had an area for the design of an atrium house between 4000-5500 *p.q.* and can be divided into four groups[281].

GROUP 1: 28'x40' ATRIUM: based on proportional relationship of 7:10 (appr. 1:√2)

Domus Cornelia	total plot 56'x74'	design width[282]:14' - 28' - 14'
VIII 4, 15	total area ca. 4000 *p.q.*	design depth[283]:14' - 40' - 20'
Casa della Calce	total plot 56'x80'	design width: 14' - 28' - 14'
VIII 5, 28	total area ca. 4500 *p.q.*	design depth: 20' - 40' - 20'

GROUP 2: 36'x51' ATRIUM: based on proportional relationship of 12:17 (appr. 1:√2)

Casa di N. Pop. Prisc.:	total plot 60'x85'	design width: 12' - 36' - 12'
VII 2, 20	total area ca. 5000 *p.q.*	design depth: 17' - 51' - 17'
Casa dei Cap. Fig.:	total plot 60'x87'	design width: 12' - 36' - 12'
VII 4, 57	total area ca. 5000 *p.q.*	design depth: 15' - 51' - 21'

GROUP 3: 32'x46' ATRIUM: based on proportional relationship of 16:23 (appr. 1:√2)

Casa del Torello:	total plot 60'x80'	design width: 14' - 32' - 14'
V 1, 7	total area ca. 4800 *p.q.*	design depth: 14' - 46' - 20'
Casa di Philippus:	total plot 60'x85'	design width : 14' - 32' - 14'
VI 13, 2	total area ca. 5000 *p.q.*	design depth : 18' - 46' - 21'
Casa di M. Ter. Eud. :	total plot 60'x85'	design width : 14' - 32' - 14'
VI 13, 6	total area ca. 5000 *p.q.*	design depth : 18' - 46' - 21'
Casa del Pr. di Mont.:	total plot 60'x77'	design width: 14' - 32' - 14'
VII Ins. Occ., 12-14	total area ca. 4500 *p.q.*	design depth: 11' - 46' - 20'
Casa di M. Ob. Firm.	total plot 46'x105'	design width: 32' - 14'
IX 14, 2-4 (Tuscan atr.)	total area ca. 4800 *p.q.*	design depth: 32' - 46' - 21'

[280] In the total group of eigtheen houses, the Casa di M. Obellius Firmus is represented twice, once with the tetrastyle and once with the Tuscan atrium, which are based on different designs. The total number of atrium houses in the comparison is then nineteen.

[281] The detailed analyses of these houses are presented in Part I of the thesis. The most relevant information is presented in tables I and II above.

[282] The measurements for the design width represent the following sequence: width of the left side range – width of the atrium – width of the right side range.

[283] The measurements for the design depth represent the following sequence: depth of the front range – depth of the atrium – depth of the back range.

GROUP 4: 42'x42' ATRIUM: based on proportional relationship of 1:1

Casa del Labirinto:	total plot 70'x72'	design width: 14' - 42' - 14'
VI 11, 8-10 (tetr. atr.)	total area ca. 5000 *p.q.*	design depth: 12' - 42' - 18'
VI 13, 13:	total plot 70'x81'	design width: 14' - 42' - 14'
	total area ca. 5500 *p.q.*	design depth: 18' - 42' - 21'

The comparison of the designs of these eleven houses clearly shows that the architectural tradition for the construction of private architecture in Pompeii was, at least partly, based on set schemes and proportions. The dimensions of the central court area (atrium) and its position in the centre of the width of the plot were the key elements that defined the overall division of space. The position of the atrium within the depth of the house was, however, not bound to such strict rules. Here, the architect could use the available space to create sight lines and position the atrium accordingly. The standardization of designs was not confined solely to the general outlines of the house, but could also include the more detailed internal divisions of space. For example, the design of the Casa di Philippus and the Casa di Terentius Eudoxus and that of the Tuscan atrium of Obellius Firmus are nearly identical in all aspects, including the size and position of the impluvium, dividing the open space of the atrium, which formed part of the original design scheme.

The architect's choice to work with a particular design model also implied working with a particular series of approximations. For example, the design model of the houses in group 2 was based on an approximation of $1 : \sqrt{2} = 12 : 17$, a system based on thumb measures (12 thumbs to a foot). For the houses in group 3, however, the architect worked with an approximation of $1 : \sqrt{2} = 16 : 23$, based on a system of fingers (16 fingers to a foot). The choice to work with a system of fingers or thumbs created a different series of approximations for the Pythagorean sequence of $1 : \sqrt{2} : 2$:

12 (1) : 17 ($\sqrt{2}$) : 24 (2)
16 (1) : 23 ($\sqrt{2}$) : 32 (2)

The choice for a particular series of approximations was based on the desire to use measures on the building site that were suited for the practical circumstances in each case, such as the dimensions of the building plot, as well as the individual desires of the client. For example, in the case of the Casa del Torello, the Casa di Philippus, the Casa di M. Terentius Eudoxus and the Casa del Principe di Montenegro, all houses with a 60' plot width, the architect created a more narrow atrium (32') and relatively spacious side ranges (14'), while the architect of the Casa di N. Popidius Priscus and the Casa dei Capitelli Figurati used the same plot width to construct a wider atrium (36') and more narrow side ranges (12'). Although these changes may seem insignificant, they had a significant impact on the total structure, for they represent a different design model, based on different proportional relations that were consequently executed throughout the entire house.The fact that both systems described above were used in ancient building practice is evident by the finds of Roman measuring tools displaying both systems next to each other (Fig. 24).

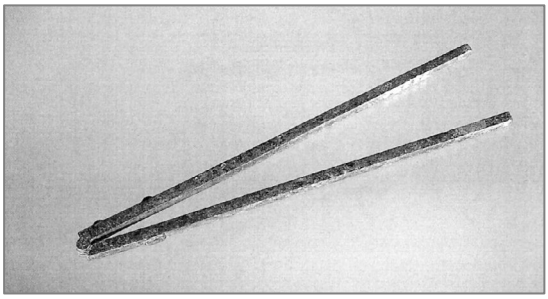


Figure 24: *Modulus* or *regula* (unit of measure) from Pompeii, 1st c. AD (Ciarallo/De Carolis 1999, nr. 380)

The presence of remarkable similarities in the layout and proprotions of Pompeian houses was also studied by Peterse for a group of three houses: the Casa degli Scienziati (VI 14, 43), the Casa del Chirurgo (VI 1, 10) and the Casa del Naviglio (VI 10, 11)[284]. He considered these houses as closely connected on the basis of several factors. Firstly, Peterse dates their construction (limestone framework) to the same period in the fourth century BC. Secondly, they each represent elite housing, and thirdly, they appeared to be based on the same initial layout. Following a metrological analysis of all three houses, Peterse concludes that they were all based on a fixed model that resulted in a standardized design. In his opinion, the architect's task may have been reduced merely to the proper implementation of that model, adjusting it to fit each specific situation by introducing modifications as pragmatic solutions. This means that the architect did not have to be an educated man but rather a craftsman, as the priciples of design were already part of the fixed model. In that design, Peterse did not recognise any evidence for an overall scheme of proportion and therefore concludes that it was based primarily on the adding together of functional values, which for practical reasons were fixed in unbroken multiples of the Oscan foot. According to him, the presence of a design system of ratios that unites the different proportional elements, can only be demonstrated for the Hellenised period of Pompeii. With this remark, he implies the existence of a chronological boundary, separating the early fourth century houses, constructed after a fixed model based on the adding together of functional values, and the later houses of the Hellenistic period that were based on proportional design systems.

In light of the results presented in the current study, as well as the results of other recent studies on Pompeian architecture, I have to raise objections to Peterse's assumptions and conclusions on several points. One of Peterse's arguments for grouping together the three houses is their supposed construction date in the fourth century BC. Recent stratigraphic research in a number of atrium houses in different areas of the city has produced convincing evidence that we can no longer take the traditional early construction date for the limestone framework houses seriously. The presence of an earlier layer of occupation underneath all presently standing structures has pushed the construction date for the atrium

[284] Peterse & de Waele 2005, 197-219.

(-peristyle)houses present in the city layout of AD 79 up to anytime after 200 BC[285]. More specifically, the construction date for the Casa del Chirurgo, one of the houses in Peterse's sample, has also been confirmed around 200 BC by the Anglo-American project[286]. As far as this particular house is concerned, I have to conclude, based on the results of the metrological analysis presented in the current study, that its design is based on an intricate system of geometric proportions including not only the design of the atrium house, but also the garden-area at the back and the strip of land to the right of the house, both part of the same original property[287]. These conclusions clearly contradict the reconstruction by Peterse of the Casa del Chirurgo as based on a fixed model, whereby the proportions applied where not interrelated.

Even though the recognition by Peterse of similarities between the designs of three Pompeian atrium houses is certainly valid and meaningful, I prefer a different interpretation of the underlying principles that caused these standardised or 'textbook' designs. With the chronological distance between the houses analysed by Peterse and the houses analysed in the present study no longer valid, they can and must all be considered as the product of the same architectural tradition, belonging to a common language widely diffused throughout the Italian peninsula[288]. The architects of the Pompeian houses formed part of that tradition, which offered them set schemes and proportions that had been tried and tested by generations before them and were part of a professional common good. Within this system of architectural traditions and guidelines, the architect and client still had room to create individual solutions and variations. I would prefer to see the Pompeian architects or professional builders as working with the means they were taught within a tradition that was bound by its own sets of rules, rather than reducing them to mere executors of a preconceived fixed model.

Even when two houses were constructed along the same lines of design, it may be wrong to assume that they subsequently portrayed the same image to the outside world. Take for example the Casa del Labirinto and house VI 13, 13, which are both based on the same design principles with an equally sized square atrium (42'x42') at the centre. Despite the many similarities in their designs, upon entrance, the Casa del Labirinto appears much larger and is certainly more impressive than house VI 13, 13. This is due to a number of aspects, including the presence, in the Casa del Labirinto, of a spacious tetrastyle impluvium, as well as a large peristyle-garden with a Corinthian oecus at the back and a secondary atrium to the side. Compared to this, house VI 13, 13 seems rather meagre and is incapable of leaving the same impression on a visitor. Clearly, even working within these set schemes and traditions, the

---

285 These developments are discussed in Chapter I, 'recent developments: a critical revision of the chrono-typology'.
286 Jones & Robinson 2007, 389-392.
287 See Part II, 58-64.
288 See also Wallace-Hadrill 2007, 285-86.

architect and/or decorator could manipulate a house by its internal structures and decorations to create a totally different look and feel.

In addition to the eleven 'textbook' houses in the current sample, there is another group of six houses with an area ranging between ca. 3500-6000 *p.q.* for the construction of an atrium house, which show no resemblance in their design to the four groups described above or to each other.

Casa del Menandro:	total plot 70'x70'	design width: 17' - 26' - 17'
I 10, 4	total area ca. 5000 *p.q.*	design depth: 12' - 42' - 18'
Casa del Torello:	total plot 60'x90'	design width: 14' - 32' - 14'
V 1, 7	total area ca. 5500 *p.q.*	design depth: 20' - 48' - 22'
Casa di L. Caec. Iuc.:	total plot 54'x81'	design width: 12' - 30' - 12'
V 1, 26	total area ca. 4500 *p.q.*	design depth: 18' - 42' - 21'
Casa del Chirurgo:	total plot 50'x70'	design width: 10' - 30' - 10'
VI 1, 10	total area ca. 3500 *p.q.*	design depth: 15' - 35' - 20'
Casa di Pansa:	total plot 60'x94'	design width: 13' - 34' - 13'
VI 6, 1	total area ca. 5650 *p.q.*	design depth: 22' - 52' - 20'
Casa del Cinghiale:	total plot 48'x88'	design width: 10' - 28' - 10'
VIII 3, 8	total area ca. 4200 *p.q.*	design depth: 20' - 48' - 20'

The internal division of plot space in each of these houses was the result of an individual solution to the specific situation. These houses are, however, part of the same architectural tradition as the 'textbook' houses, as their designs were based on the same methods and principles and followed the same basic model. The fact that none of the specific proportional relations of these six houses are identical to another house may be the result of individual choice by the architect, but may also be due to the limited number of houses here analysed. We know, for example, that the design of the Casa di Pansa was based on the same model as the design of another Pompeian atrium house outside the sample of this study, namely the Casa di Sallustio, which was analysed by Geertman[289]. If more Pompeian houses were subjected to a metrological analysis, it seems likely that we will find a larger number and variety of 'matches'.

[289] Geertman 1984a.

3. DESIGNS FOR LARGER ATRIUM HOUSES (≥7000 *P.Q.*)

The remaining three atrium houses of the sample are all larger than the 4000-6000 *p.q.* houses described above. None of these larger houses reveal significant similarities in their respective designs.

Casa del Gallo:	total plot 66'x120'	design width: 15' - 36' - 15'
VIII 5, 2-5 (atrium 2)	total area ca. 8000 *p.q.*	design depth: 22½'–43½'–18'
Casa di M. Ep. Rufus:	total plot 70'x98'	design width: 14' - 42' - 14'
IX 1, 20	total area ca. 7000 *p.q.*	design depth: 14' - 63' - 21'
Casa di M. Ob. Firmus:	total plot 74'x102'	design width: 12' - 50' - 12'
IX 14, 2-4 (tetr. atrium)	total area ca. 7500 *p.q.*	design depth: 20' - 62' - 20'

The three houses in this group belong to a different, much larger and less common category, with areas for the atrium houses ranging between 7000-8000 *p.q.* The Casa del Gallo is a unique example, constructed as a double atrium house in a single construction phase. The design of atrium (2) formed part of the overall design, whereby the side ranges were given an exceptional depth of 15'. In the design of this house, the two atria together share only three side ranges, with the central range being used by both atria, which accounts for the increased depth of each individual range. The other two houses, the Casa di M. Epidius Rufus and the Casa di M. Obellius Firmus, both have a remarkably wide atrium compared to the other houses in the sample. Clearly, when a person was able to purchase a wider plot, he did so with the intention of having a wider atrium fitted into that plot. The creation of an appropriate design for these large high status houses was left in the hands of a professional, who enjoyed relative freedom working with such a spacious plot.

4. ARCHITECTURAL RESTRICTIONS, SOLUTIONS AND TRADITION

From the comparison of data discussed above, we may conclude that the biggest restriction in the design of an atrium house was the width of the available plot of land. The general trend seems to be that as the plots get wider, so do the atria. This is at least partly caused by the fact that the side ranges normally had a standard depth between 12' and 14', as the result of living conditions and practical restrictions of the building materials used. These standard measures were, however, not always respected, as in the case in four of the atrium houses in the sample. In the Casa del Chirurgo and the Casa del Cinghiale, a concession was made to the space for the design and construction of the atrium house, in order to create room for commercial and/or industrial activity on a strip of land to the side of the house, which was part of the same property. Rather than to loose space in the width of the atrium, both houses were constructed with remarkably narrow side ranges, only measuring 10' in depth. The Casa del Gallo, on the contrary, enjoyed the luxury of rather large side ranges, measuring 15' in depth. This property was already marked as a unique example of an original double atrium house with only three, relatively deep side ranges shared by the two atria. The

Casa del Menandro had side ranges of an exceptional depth, measuring 17' next to a relatively narrow atrium of 26'. This house was an exceptional case in many respects, and was constructed without a formal design, aspects that will be further explained and discussed[290].

To sum up, to my opinion the Pompeian atrium houses in this research form part of a longstanding tradition of private architecture. In the design tradition and practice that was used in the construction of these houses, the arithmetic affects of geometric constructions and proportions – in general and of certain procedures in particular – were well known and purposely used and manipulated. Within this tradition, the different practical, economical and ideological factors that together defined the structure of this courtyard house type, had culminated in series of set schemes of proportions. Regarding the kinds of architects that were at work in the particular situation of the Samnite town of Pompeii, they were most likely professional tradesmen with a sound education of the trade. This offered them the knowledge that was required by the building practice, to think in shapes and proportions and calculate in figures[291]. It was this intimate knowledge of this tradition, with all its requirements and regulations, which allowed the skilled professionals to introduce the subtle yet effective variations that we can so clearly recognise through the metrological analysis in the otherwise rather uniform houses.

5. DESIGNS OF THE PERISTYLE-GARDENS

The metrological analysis of the sixteen peristyle-gardens in the sample reveals a completely different picture than the atrium houses (see Appendix: Chart 2). None of the gardens show signs of being based on the same or a similar design and we therefore cannot recognise any significant uniformity within the group, other than the presence of a three or four-sided peristyle with ambulatories to the sides. The signs of a longstanding building tradition that were so clearly present in the designs of the atrium houses, are absent in the designs of the peristyles[292]. Recognising a clear and coherent system of proportions was only possible in those properties that were originally constructed as an atrium-peristyle house in one building-project. In these cases, the atrium house and peristyle-garden were part of one overall scheme of design, whereby the architect had managed to integrate the new element of the peristyle into the existing design traditions of the atrium house: the Casa di Pansa (VI 6, 1), the Casa dei Capitelli Figurati (VII 4, 57), the Casa del Principe di Montenegro (VII Ins. Occ. 12-14) and the Casa del Cinghiale (VIII 3, 8). In all the other properties in the sample, the atrium house and garden-area were designed in two separate phases and the division of space within the garden appears to have been based on a combination of practical and

---

[290] The metrological analysis of the Casa del Menandro creates a surprising picture of this house, which is described in *Two grand houses in an 'unattractive position'*, p. 106 ff.
[291] Geertman 1984a, 49.
[292] See also Evans, who mentions that the peristyle was not constrained by the same rules as the atrium quarter, resulting in a much freer planning of the garden-area (1980: 226-227).

aesthetical reasons, whereby the proportions of the atrium house were sometimes partly copied to create the dimensions of the peristyle and ambulatories.

The picture that emerges from the metrological analyses of the peristyle-gardens is that of a rather haphazard and ad hoc way of design. The lack of a formal tradition is certainly understandable, as the peristyle was never part of the indigenous architectural trade and was introduced into the atrium house architecture at a relatively late date. Schoonhoven also remarked in her study of the metrology of Regio VI that the backs or garden areas of house plots were frequently less precisely measured out than the front parts. Reason for this phenomenon was probably the fact that the garden areas were separated by semi-permanent partitions for extensive periods of time, causing small shifts in the original outlines of the plots[293]. Regarding the internal division of space, the question is whether the Pompeian architects were still in the process of developing a more systematic system of design for the peristyle-gardens or if they did not actually attempt to create a method of design specifically meant for the peristyle.

6. SPATIAL INTEGRATION BETWEEN ATRIUM HOUSE AND PERISTYLE-GARDEN

The majority of the houses, constructed in at least two different building phases, reveal no coherence between the methods of design used in the atrium and the peristyle. This makes it especially remarkable that in a number of these houses the two residential areas did reveal a degree of spatial integration, introduced by the architect through the deliberate use of proportions and dimensions (see Appendix: Chart 2). The metrological analyses revealed a significant spatial integration in five houses, where the peristyle-garden was added to an already existing atrium house: the Casa del Torello, the Casa del Labirinto, the Casa di Philippus, Domus Cornelia and the Casa della Calce. In these cases, the architects responsible for the construction of the peristyles took the existing design of the atrium house and used certain elements of that design to create a feeling of spatial unity. In addition to these five examples, there are also the four properties that were designed as one structure, and consequently held a strong relation between the atrium and peristyle: the Casa di Pansa, the Casa dei Capitelli Figurati, the Casa del Principe di Montenegro and the Casa del Cinghiale. In these nine houses, this architectural feature of spatial integration was recognisable through the metrological analyses, and is significant for our understanding of the professionalism of the architectural trade in Pompeii. It can also shed light on the social systems that were engrained in the hierarchical build-up of the different spaces within the house.

As was already discussed above in the reviews of the studies by Dickmann and Wallace-Hadrill, the addition of the peristyle-garden to the atrium house introduced new opportunities for further hierarchical differentiation within the house. In this context, Dickmann and Wallace-Hadrill interpreted the apparent lack of spatial integration of the

---

[293] Schoonhoven 2006, 169.

peristyle into the traditional town house as a sign that the atrium and peristyle functioned next to each other as independent units. The results of the metrological analyses, however, at least partially contradict this interpretation. In fact, it seems that one of the architect's first priorities was to create certain spatial connections and through-routes between the atrium and peristyle, in an attempt to draw the two living areas together into one 'living experience'. This, however, in no way contradicts the important underlying social message that was recognised by Dickmann and Wallace-Hadrill and which was sent to anyone entering the house. This was a message of highly differentiated areas within the atrium-peristyle sequence, some parts of which might be entered, while others remained exclusive. In fact, the strong spatial integration that is created by the architect's choice of certain measurements, focal points, visual lines and thresholds only served to enhance this feeling: one is being drawn to something but not immediately able to reach it. To my opinion, the design of a house aims to reach spatial unity, while the users of that space manipulate it to create the desired hierarchy[294].

One of the features in the design of atrium-peristyle houses that most clearly documents the spatial integration between the different parts is the line of sight running along the axis of the property, which Martin Watts describes as a *deep view*, intended to reinforce the conceptual axis of the house. Upon entering, one could immediately comprehend the order of the house and its extent, with the strong visual axis overriding any irregularities of the plan[295]. One good example of a highly symmetrical and carefully planned set of visual dynamics along the central axis is present in the Casa di Philippus (Fig. 25). The consecutive layout of the atrium and peristyle is proportioned in such a way that several 'main areas' were created: the first area, from the threshold to the atrium until the front wall of the alae (the 'closed part' of the atrium side walls), measures 32'; the following open area of the alae measures 14'; the third area comprises the space of the tablinum and the portico behind it, marked at the back by the front row of the colonnade and measures 32' again (21'+11'); The last main area measures a total of 46' (34'+12') and runs from this point until the back wall of the peristyle, which also marks the entrance to the central oecus behind. These areas 32'-14'-32'-46', which

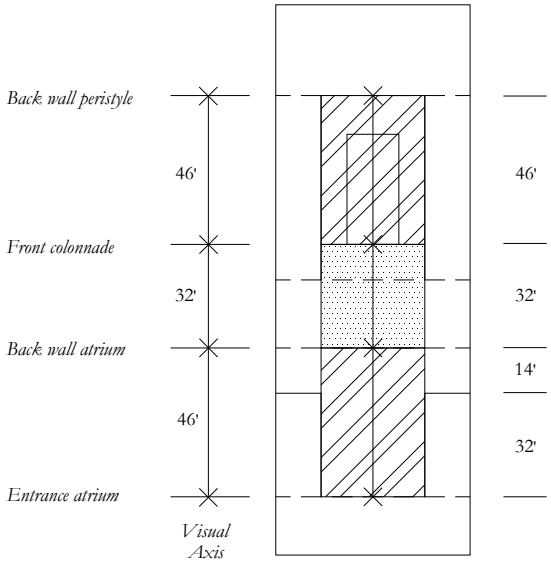


Figure 25: House of Philippus: visual axis (drawing author)

[294] See also Van Krimpen-Winckel 2006, 154-155.
[295] Martin Watts 1987, 142-144.

represent the principal proportions of the architect's design (x : x√2-x : x : x√2), create a strong proportional division of space along the visual axis of the property. Upon entering the house, the visitor's eye would be drawn to several points, which were clearly marked in the constructed space, immediately creating a feeling of symmetry and spatial unity: the atrium back wall (46'), the front colonnade (32') and the peristyle back wall (46'). A remarkable aspect of this visual axis is that it can be reversed: the same dynamics are perceived standing in the entrance to the house, looking towards the back as when standing at the back of the house, when positioned in the entrance to the grand oecus behind the peristyle, and looking towards the front. Only the built situation would have created a different feel to these view directions, looking from the dark of the atrium towards the light of the peristyle when entering the house, and from the light of the peristyle into the relative darkness of the atrium when the back of the house had already been penetrated.

Clearly, the fact that the peristyle-garden was added at a later date to the existing atrium house did not stop the architect from creating a unified picture. He must have been well informed on the original design of the atrium house, allowing him to integrate the peristyle-garden in the way depicted. Four other atrium-peristyle houses that were also constructed in two different phases show a comparable level of spatial integration in the visual axis from front to back. In the Casa del Torello, the architect created a similar, spatially integrated picture of atrium and peristyle. Along the visual axis, the dynamics were shaped in such a way that a series of repeating dynamics was created from front to back[296]. In the Casa del Labirinto, the dimensions of the peristyle-garden were directly derived from the dimensions of the original plot, and respected the general lines of the layout of the double-atrium house at the front[297]. In the Domus Cornelia, the architect manipulated the viewer into thinking that the design was perfectly symmetrical despite the reality of the unfavourable position of the peristyle behind the atrium, caused by the irregular plot. He did so by leading the axial view through two columns to the right of the centre of the peristyle and repeating the dynamics present in the design of the atrium house[298]. In the Casa della Calce too, the viewer's eye was guided from the entrance to the atrium to the back wall of the garden along a series of regular measurements that reflected the principal dynamics of the original design[299].

The four atrium-peristyle houses in the sample that were constructed in one building phase also show a high level of spatial integration in the different elements of the atrium and peristyle. In these cases, one would expect as much, with one architect responsible for the conception of the entire design, allowing him to create a coherent total picture.

---

296 See Part II, 25-32.
297 See Part II, 93-106.
298 See Part II, 241-254.
299 See Part II, 284-294.

7. PROFESSIONAL TRADITION AND COMMON KNOWLEDGE IN THE POMPEIAN ARCHITECTURAL TRADE

The comparison of the results of the metrological analyses (tables I and II) enables us to discuss some aspects of the building practice and traditions of private architecture in Pompeii. Concerning the design practice of the atrium houses in this study, all presumably originally dating to the Samnite period of Pompeii, we have learned that their design and construction was largely regulated by set traditions and rules. These were caused by different factors of a practical, economical and ideological nature. The size, and especially the width, of the building plot formed a prominent restriction to the architect's freedom in the process of design. Nonetheless, the professional tradesmen who were at work in Pompeii possessed enough theoretical knowledge and practical know-how to introduce variety to the houses within this framework of restrictions. This conclusion contradicts Grahame's point of view on this topic, who states that Pompeian houses did not have relatively standardised plans and finds it difficult to sustain that the builders of these houses followed a common set of rules (2000: 5).

Regarding the peristyle-gardens that were, in the majority of cases, added to the atrium houses at a later (Roman) date, there were no such strict rules and traditions for their design and construction. The division of space within the garden-area and the layout of reception spaces were certainly well planned according to proportional relations, but we could not discern formal design models or set series of measurements recurring in different properties.

Clearly, there is a large gap between the design methods used in the atrium houses and those applied in the peristyle-gardens, both chronologically and methodically. However, a remarkable number of atrium-peristyle houses show a metrological relationship between the two living areas and/or along the visual axis of the structure[300]. This leads to the conclusion that whoever was in charge of the construction of the peristyle was aware of the design scheme of the already existing atrium house. If the chronological gap between the construction of the atrium and peristyle was relatively short, the same architect may have been put in charge of both projects. We may also imagine that the professional building trade was a family business, whereby the knowledge was passed on from father to son, thus remaining in existence for generations.

In any case, we may safely assume that the knowledge of certain design models and set series of proportions was common good. In antiquity, without the aid of modern tools such as computers, calculators and fancy drawing tables, the architect or professional builder had to rely mostly on memory and the constant practice of that memory. The ancient architect was accustomed to applying mental arithmetic on a spatial level. If he encountered a certain sequence of measurements in an existing building, he most likely immediately knew which system of measurements they belonged to, allowing him to recognise the original design scheme of the structure and to successfully integrate any new elements into that scheme.

---

[300] Also remarkable is the fact that the design and construction of all the peristyle-gardens, even those that were added in the Roman period, were executed in Oscan feet rather than Roman feet. This is yet another symptom of the longstanding and persisting building tradition that continued on from Samnite Pompeii.

The urban context: value and consequences of a particular location

On the property market today, everyone is primarily concerned with one thing: location. It seems that in the urban setting of ancient Pompeii, this factor played a no less significant role in the purchase of a plot of land and the construction of a house, even though the type of location favoured was radically different than what we aspire today. As much as we value tranquillity and privacy for our city residences today, the Pompeian elite had a strong preference for the busiest locations fronting the main streets that intersected the urban landscape.

Studying the positions of the atrium-peristyle houses within the city, combined with what we know about the competitive nature of its society, two factors seem to have been particularly important in the location of the home of an influential man or one aspiring to be such. Firstly, there were several zones within the city that were especially popular amongst the elite. Again, we can make a comparison with our present day society, where there are certain areas in cities that are considered chic and respectable to live in, and other areas that are decidedly not. The favoured areas see a clustering of wealthy houses, for the presence of wealth and power works like a magnet, attracting more wealth and power and those emulating and aspiring it. Secondly, in Pompeii, the visibility of an elite house was of major importance. Preferably, the house frontage was situated on one of the city's busy through-routes, such as the Via dell' Abbondanza, the Via Stabiana or the Via delle Terme/Via della Fortuna/Via di Nola. Ray Laurence analysed the use of the urban environment through the measurement of the occurrence of doorways in streets, whereby he considered the number of doorways opening into a street to be a direct reflection of the level of social activity and interaction[301]. The main arteries of the city attracted property owners from opposite ends of the spectrum, being favoured not only by the elite, but also by those with small commercial enterprises, such as shops and bars. Schoonhoven's study of the original plot division of the insulae in the *Mercurio* area revealed that house plots of different scales and status were purposely situated in specific areas, showing that the local authorities were also involved in the original distribution of house types[302].

As has been stressed time and again by modern scholars studying the social life of Pompeii, the home of the members of the elite fulfilled not only a private function, but was also the locus of public life. By surrounding himself with a large group of clients that would call at his house during the morning *salutatio*, the *paterfamilias* of a large town house could strengthen his political position within the community. The location of his house on a major road, a highly visible location, ensured that a large number of passers-by would be impressed by the façade[303]. Furthermore, as the doors to these grand houses were left open for at least

[301] Laurence 1994, 88-103.
[302] Schoonhoven 2006, 184-185.
[303] Robinson 1997, 142.

part of the day, the view into the house was also of great importance. In other words, the house of an elite member of Pompeian society played an active role in expressing his social status and ambitions. On the location of elite residences within the city, Robinson remarks that ".. for the Pompeian elite the location of their domus was not just a Ciceronian exercise in self promotion: it was not enough to locate one's house in a prominent position, it also had to be sufficiently distanced from other houses to avoid being outshone by the grandeur of potential social rivals"[304]. However, if we consider this remark in relation to the atrium-peristyle elite residences such as those situated in the insulae VI 11, VI 15, VI 12, VI 13 and VII 4, we must conclude that, in reality, these houses are clustered together in a rather confined area of the city. And although these houses may not belong to the absolute top of the bill in residential complexes such as, for example, the Casa del Fauno, they most likely do belong to the group of politically active elite members of Pompeian society that Robinson is referring to. It seems that positioning a house in a prominent position within the city to get the most attention and at the same time being in close proximity to others who are trying to accomplish the same, are two elements of Pompeian life that go hand in hand. It seems almost inevitable that a highly visible position within the city's road network attracted a clustering of elite houses belonging to politically active members of society who all had the same goal, to assemble a group of dependants, representing election votes. If the house of a member of the elite was indeed located nearby comparable houses of the same social class, this must have further intensified the competition between house owners, who, in the design of their house needed to ensure that it put them in the best possible light and created an image that would somehow attract particular attention.

1. ATTRACTIVE ZONES FOR ATRIUM-PERISTYLE HOUSES

As said, we may expect that there were certain areas within the city centre that were particularly attractive to the elite members of society. On the distribution of houses in the city, Robinson concluded that while reasonably successful citizens lived in more spacious houses away from the main streets and core area, the numerically small elite dominated city life from imposing residences, fronting onto the main streets and spread out roughly evenly over the entire city[305].

To my opinion, we can specify this description a little further by identifying several more specific areas within the city that hold a relatively high concentration of elite houses. From the current sample of houses, but also more in general, a significant clustering of atrium-peristyle houses can be recognized in the following zones:

a. The area immediately to the northwest of the forum, specifically the stretch of road formed by the Via della Fortuna and the Via delle Terme[306].

---

304 Ibidem, 143.
305 Ibidem.
306 This stretch of road counts nine atrium-peristyle houses: VI 6, 1, VI 10, 14, VI 12, 2-5, VI 13, 2, VI 13, 6, VII 4, 51, VII 4, 57, VII 4, 59, VII 4, 62.

b. The first stretch of the Via dell'Abbondanza running from the forum up to the crossing with the Via Stabiana[307].

The high concentrations of atrium-peristyle houses in these two zones can be explained by a combination of two factors, namely the position directly onto a main road and the close proximity of the political and religious centre of the city, attracting large groups of people on a daily basis. If we relate these two zones to the locations of the houses in the current sample, we see that four houses were positioned along the Via delle Terme/Via Fortuna[308] and another four along the first stretch of the Via dell' Abbondanza[309]. Eight houses out of the sample of eighteen is a relatively high number to be situated along these two rather short stretches of road within the entire road network of Pompeii. They thus confirm Robinson's conclusions about the elite being positioned in visible and busy locations, where they could best advertise their social power.

Of the remaining ten houses in the sample, five were also positioned on main roads, but further away from the heart of the city centre. These houses were situated on the Via di Nola[310], the Via Vesuviana[311], the Via dell'Abbondanza[312] and the Via Consolare[313]. Another three houses in the sample were located in the heart of the city centre, but on back streets or alleys instead of the main roads. The Casa del Labirinto (VI 11, 8-10) was located on the Vico di Mercurio, house VI 13, 13 on the Vico dei Vettii and the Casa di N. Popidius Priscus (VII 2, 20) on the Vico del Panettiere. These back streets lacked the open character and space that was characteristic of the main roads, instead being narrow and dark, while the walls of the properties fronting them had a distinctly closed character, only interspersed by the odd entranceway[314].

2. TWO GRAND HOUSES IN AN 'UNATTRACTIVE' POSITION

The last two houses in the sample are both located in a position that is neither in the heart of the city centre, nor on a main road. Instead, they were constructed in a relatively invisible and peripheral position. In comparison with the rest of the sample, these two houses, the Casa del Principe di Montenegro (VII Ins. Occ. 2-4) and the Casa del Menandro (I 10, 4) form an exception, and there must be other reasons than those stated above for the choice of their location.

---

[307] This stretch of road counts six atrium-peristyle houses: VIII 3, 8, VIII 5, 2-5, VIII 5, 28, VIII 4, 4, VIII 4, 9, VIII 4, 15.
[308] Casa di Pansa (VI 6, 1), Casa di Philippus (VI 13, 2), Casa di M. Ter. Eudoxus (VI 13, 6) and Casa dei Capitelli Figurati (VII 4, 57).
[309] Casa del Cinghiale (VIII 3, 8), Casa del Gallo (VIII 5, 2-5), Domus Cornelia (VIII 4, 15) and Casa della Calce (VIII 4, 28).
[310] Casa del Torello (V 1, 8), Casa di M. Obellius Firmus (IX 14, 2-4).
[311] Casa di L. Caecilius Iucundus (V 1, 26).
[312] Casa di M. Epidius Rufus (XI 1, 20).
[313] Casa del Chirurgo (VI 1, 10).
[314] See also Laurence 1994, 88-95.

For the Casa del Principe di Montenegro, these reasons are not hard to find, as the choice for its peripheral position on the southwest side of town was surely based on the spectacular views that could in ancient times be enjoyed from within the house over the *marina* and the sea[315]. In the crowded city centre, this type of unobstructed view into the open was rare. The construction and design of the house were such as to take full advantage of this phenomenon, with the house built on two levels and the row of reception spaces on the lower level focussed outward towards the sea[316]. For the owner of this house, these priceless qualities were enough to compensate his somewhat disadvantuous position within the city's road network.

In the case of the Casa del Menandro, situated in insula I 10 just east of the Via Stabiana, the reasons for this specific location are not as readily understandable. Especially considering the fact that it was, in its final layout, one of the largest and most conspicuous properties in the city. Here, we can gain more insight in the design and construction process and in the type of owner who built and lived in this property, from the results of the metrological analysis[317]. Both the atrium house and the peristyle-garden of the Casa del Menandro were constructed without a formal design, in contrast to the other seventeen houses in the sample, which all revealed the presence of an underlying system of proportions. The story told by the metrological analysis is that of an owner who perhaps quickly came into a large amount of money, allowing him to purchase several properties surrounding his own. The old nucleus of the atrium house was extended by the addition of a peristyle-garden with several spacious and finely decorated reception rooms, as well as a private bath suite. The lack of a formal design in the proportions and dimensions of the rooms in both the atrium house and the peristyle-garden leads to the picture of the house owner taking the construction of his house into his own hands, with the aid of a team of builders, who recreated the general layout of an atrium house and a peristyle-garden. The fact that the Casa del Menandro, a house frequently cited by modern researchers[318] as a stately symbol of wealth and power, caused by its grandeur, high standards of decorations and impressive views, was actually the result of a rather unconventional construction campaign creates a completely different picture from what we had in mind up to now. It also says something about the man that owned this property. In the well-established, small group of the city's elite, there was a strict code of rules and regulations that were faithfully followed when an atrium(-peristyle) house was constructed. One of those rules was to commission a professional builder/architect to design the house according to professional standards and oversee its construction on site. This

---

315 For a description of the construction of houses on the southern and western slopes, in the first half of the first century BC immediately after the Roman colony had been founded, with a panoramic view across the bay, see Zanker 2000, 143-145; also see Tybout 2007, 407-420.
316 Zanker describes these houses, with their panoramic views and living areas on different terraces as "urban villas". This development forms part of a more general trend starting in the late second and early first centuries, when wealthy Pompeian home owners used the villa as a model for cultivated living (Zanker 2000, 143-145).
317 For a more thorough discussion of the Casa del Menandro see Part II, 8-18.
318 For example most recently Clarke 2007, 323-335 and Nappo 2007, 367-371.

homeowner blatantly acted outside what must have been rather strict guidelines, an action that cannot have gone by unnoticed by his (aspired) peers.

The general picture that the Casa del Menandro portrays of its owner, with its lack of a formal design and conspicuous display of wealth, is that of a man belonging to the 'nouveau riche'. Despite his efforts to create an image of olde-worlde status, with which he may have been able to fool us modern viewers, his contemporaries may have had little respect for this self-made man. The fact is that wealth does not necessarily imply status and vice-versa. One source of information on this phenomenon is the group of tables with the names of witnesses found in the house of the banker Caecilius Iucundus (V 1, 26), also part of the sample. Assuming that the names were assigned to the right properties, Jongman's reconstructed ranking of the houses based on the hierarchy of their owners reveals that wealth alone was not an assured way to obtain social status[319]. Schoonhoven's visualisation of the hierarchy clearly shows that one of the houses at the bottom of the tree is the rather elegant House of Cornelius Tages (I 7, 18-19, 10-12). Comparable to what we saw in the Casa del Menandro, its elaborate architecture and decorations can be interpreted as a wish by its owner to belong to the established upper class[320]. Zanker similarly describes how the owner of this 'miniature villa', which was the end result of a conglomeration of several earlier row houses, tried his best to show off his knowledge of the symbolic language of the elite[321].

The picture that emerges from these examples is similar to what seemed to be the case in the Casa del Menandro, namely that of a rapid accumulation of wealth. In this case, the owner truly went overboard in using all available sources to demonstrate his 'language skills' in what was essentially a foreign language to him, the symbolic expressions of the elite. These examples demonstrate how difficult it is for us, modern viewers, to distinguish between two groups of elite homeowners, one consisting of those who were born into their social status and another consisting of those aspiring to become part of it.

3. THE RELATION BETWEEN LOCATION AND HOUSE TYPE: OWNER'S CHOICE OR PREDETERMINED?

At this point it may be appropriate to return to the question of the position of atrium-peristyle houses in the city. If we regard these houses as one homogenous group, as Robinson does in his *type 4*[322], we come to the general conclusions that these elite houses were constructed in visible locations on the main roads and close to the political and religious heart of the city. Indeed, nearly half the houses in the sample are in a position that meets both these requirements. As a result, they were packed closely together, creating even more tension in the competition for power and status. However, if we make a further differentiation between the houses by including size and architectural features in the equation, we come across some interesting exceptions. Tables I and II reveal that some of

---

319 Jongman 1988, 257.
320 Schoonhoven 2006, 182-183.
321 Zanker 1998, 198.
322 Robinson 1997, 140.

the largest properties, such as the Casa di M. Obellius Firmus and the Casa del Labirinto, are in fact not located in one of the 'prime' positions that were favoured in the present sample, being the Via delle Terme/Via della Fortuna and the first stretch of the Via dell'Abbondanza. In the choice of location for these two impressive residences, other reasons must have played a role. Laurence considers the locations of the houses of the elite as defined by a temporal rather than a spatial logic[323]. He reconstructed that the elite had a routine pattern of movement through the urban landscape that structured city space. Their daily routine started (*salutatio*) and finished (diner) in their homes, but took place out in public during the central part of the day, when they would visit the forum and public baths, often followed by an entourage of their clients. This type of procession of the elite through the city was a form of display, enhancing their visibility and hence their status. Laurence considers this temporal logic of elite activity as the motive behind the location of both public buildings (most notably the baths) as well as of the elite houses, which needed to be sufficiently distributed throughout the city rather than concentrated in one area, to allow for the elite display to be preserved. It seems to me that another significant factor in the distribution of elite houses was not so much a choice as it was determined by a restriction of space. As much as the social context played a role in finding the right spot for the construction of one's house, the practical aspect of space was a premise for the whole process of negotiations with the municipality, finding the right architect and commencing the building project. Without space, no building plot and no house. Especially in the case of houses such as that of Obellius Firmus, the Labirinto and Menandro, but also (outside the sample) the Casa della Nozze d'Argento (V 2, 1), the Casa del Centauro (IX 8, 3-6), which are all the end-result of several phases of growth through the acquisition of other properties, the owners were not spoiled for choice, but were basically stuck with the location of the house they already owned. Admittedly, the two grandest and largest properties in the entire city, the Casa di Pansa (VI 6, 1) and the Casa del Fauno (VI 12, 2-5) were realised in an 'A-location'. However, these two are an exception in the urban landscape, the properties of extremely wealthy and powerful men, who owned (almost) the entire insula, thus eliminating the restrictions of space.

As said, the other properties that were of a size and scale that exceeded the average atrium-peristyle house in the city, were all situated in relatively 'unfavourable' positions. As they were the result of several phases of extension, sucking smaller properties into one large residential complex, we may consider the possibility that expansion on such a grand scale was simply not feasible in the more highly valued areas of the city. The fact that the largest residential properties in the city were not located in what we generally consider the most sought after positions, also tells us something about the social structures of the elite. At first sight, we appear to be dealing with a paradox: the elite were constantly competing through the display of their wealth and power by positioning their homes for all to see, but the upper

[323] Laurence 1994, 129-132.

layer of that elite, those with the biggest houses, existed in relatively 'invisible' positions. These houses represent the highest class of people in society that did not need to join in the competition of the 'lower' elite. It appears that their revenue and existing power were sufficient to ensure their position in society without engaging in the blatant and ostentatious display of their wealth. Clearly, they did form an active part of the social rules and structures that defined the elite. The architecture and decorations of their houses were made to form the venue for the reception of large groups of people and dependants, as well as more private gatherings and dinner parties. This means that plenty of people did visit these houses on a regular basis, but rather than simply passing by them in the street, one knew where to find them.

4. POSITION AND PRETENCE: THE INFLUENCE OF LOCAL CONTEXT ON DESIGN

As a conclusion and an illustration to this chapter, I will present one specific example, a case study that was carried out as part of a preliminary study for this PhD thesis[324]. The outline of this case study will serve here to illuminate and illustrate the aspects of Pompeian private architecture discussed above. For this study we turn to a rather unique building-project, that of two houses that were constructed based on one single design, which was duplicated as a mirror-image ('twins'): the Casa di Philippus (VI 13, 2) and the Casa di M. Terentius Eudoxus (VI 13, 6)[325]. The fact that these two, independent houses were constructed in one building project and based on one design, leads to the notion that the owners must have been closely related, possible family members. This does not, however, offer a full explanation for the extraordinary situation that we are dealing with and it seems likely that placing this building project within the context of its direct surroundings could create new insights.

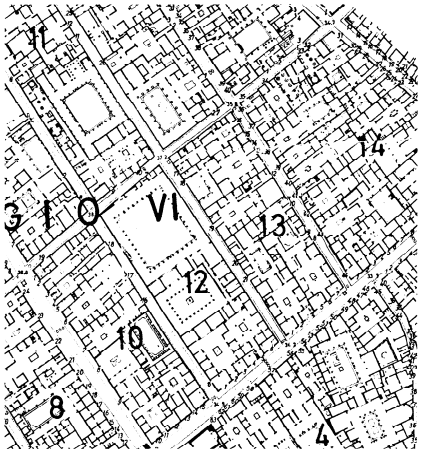


Figure 26: Insula VI 13 and surrounding neighbourhood (After Eschebach 1970).

These houses were situated on the Via della Fortuna, one of the busiest roads of the city, and in close proximity to the forum. Furthermore, their direct neighbour on the west side was the largest and most conspicuous house in Pompeii, the Casa del Fauno (VI 12, 2-5). This was not the only large elite residence that was located closely to our two houses, with the Casa di Arianna (VII 4, 51) and the Casa dei Capitelli Figurati (VII 4, 57) across the

[324] See Van Krimpen-Winckel 2006, 161-165.
[325] See part II, 110-139.

street, and the Casa del Labirinto (VI 11, 8-10) and the Casa dei Vettii (VI 15, 1) situated in the insulae immediately at the back (Fig. 26).

Being positioned in such close proximity to a large number of comparable houses of the same social class, increased the competition between homeowners, who, in the design of their house, would need to ensure that it best reflected their wealth and status. This competitive element that formed an integral part of Pompeian society was, to my opinion, of great importance in the specific case of the Casa di Philippus and Terentius Eudoxus. Obviously, their position right off the Forum on a busy spot with other large properties in close proximity, and specifically next to one of the most impressive houses in the entire city posed somewhat of a problem in the context of the social structures described above. It would have been impossible for any smaller house owner to still attract some attention next to the overwhelming grandeur of a neighbouring residence such as the Casa del Fauno, portraying such opulent luxury, wealth and power[326]. Could it therefore not have been a highly resourceful and clever move to share costs with a close relative, buy the better half of an entire insula along one of the busiest roads and construct two identical houses based on one design? If the Fauno was already present at the time when the 'twins' were built, or constructed in the same period, when the Via della Fortuna was first formalized in the early second century BC, the owners of the Casa di Philippus and Terentius Eudoxus would have aimed to give the impression that they were to be considered worthy adversaries of their neighbour.

The metrology of the two neighbouring structures helps to create a more concrete picture of the situation. Regarding the general measures of the original neighbouring plots, Schoonhoven already recognised and drew attention to the fact that the original divisory line in VI 13 at the back of the garden of the Casa di Philippus at a distance of 170' from the south façade is identical to the depth of the original building structure of the Casa del Fauno[327]. Both measures of 170' are present in the west facades of the adjacent insulae VI 12 and VI 13. Also, the architectural bi-partition of the façade of insula VI 13 into two equal parts of 60' is identical to that along the façade of the Fauno[328]. Schoonhoven's study focussed on the level of plot division within the insulae. Here, however, we can take a step further in the detail of analysis of these urban structures. By measuring and comparing the dynamics in the build-up of the façades of the House of the Faun and of the House of Philippus and of Terentius Eudoxus we can further complete the picture that already emerges from Schoonhoven's analysis. The south façade of insula VI 13 (Philippus and

---

326 The construction of the House of the Faun, consisting in its first phase of a double atrium house and only the first peristyle at the back, has been dated to the beginning of the second century BC (PPM V, parte seconda, 80-83). We may therefore assume that this house was constructed just before or possibly at the same time as the House of Philippus and Terentius Eudoxus.

327 Schoonhoven 2006, 177-186.

328 The façade of the House of the Faun was originally probably also constructed in *opus quadratum* limestone, identical to VI 13. It was only later replaced by a new façade in tuff, which can be presumed to follow the original dynamics of the limestone façade that was an integral part of the total design.

Terentius Eudoxus) portrays highly similar dynamics in the articulation of space as that of its neighbour insula VI 12 (Fauno). Both façades were articulated by an identical division of space, with a total of four shops opening onto the street and two fauces, situated between the first and the second shop and again between the third and the fourth shop, leading to the atria behind. The metrological organisation that lies at the base of these façades was analysed and revealed the dynamics as depicted in Figs. 27a-b [329]. The fact that the individual measurements of the façades of the Casa del Fauno and of the Casa di Philippus and Terentius Eudoxus are not exactly the same is immediately apparent. This can be explained by the fact that the Fauno needed to portray a clear distinction between its primary and secondary atrium, the first having a much wider entrance from the street, whereas the Casa di Philippus and Terentius Eudoxus were completely symmetrical, not only in internal layout but also in their dynamics along the façade.

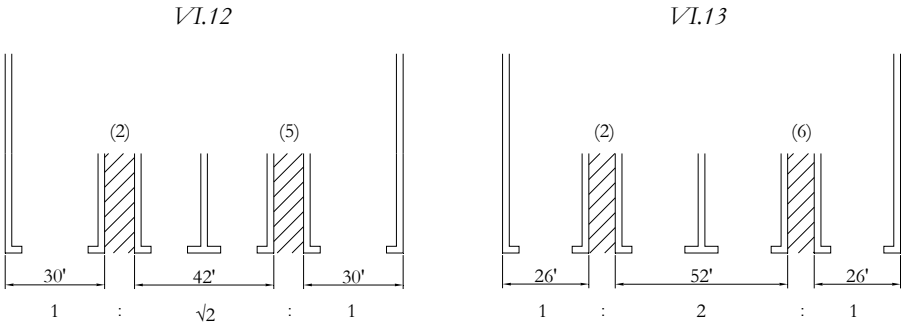


Figure 27a: Insulae VI 12 and VI 13: articulation of the façades: schematic design (drawing author)

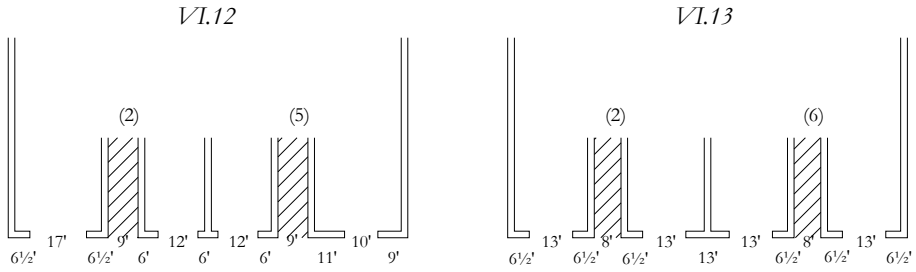


Figure 27b: Insulae VI 12 and VI 13: articulation of the façades: real measures (drawing author)

If we move to the larger picture of the façades as a whole and take into consideration the total build-up, these two insulae show a striking similarity. Both façades were divided into three areas, which were separated by the fauces leading to the two atria behind. Two of the three areas consist of the far left and right sides of the façades, comprising the opening to the

[329] The foot measures presented here are the ideal measurements of the planned layout of the façades. In the case of the House of the Faun, these were executed rather accurately in the field. The façade of the House of Philippus and Terentius Eudoxus shows some anomalies in the actual construction, caused by the fact that the length of the façade was somewhat shorter (118½') than the ideal measure of 120'.

outer shops and the walls left and right of that opening, while the third area is formed by the space in between the two fauces leading to the atria behind.

Insula VI 12:	Insula VI 13:
Left area: 6½'+17'+6½'=30'	Right area: 6½'+13'+6½'=26'
Central area: 6'+12'+6'+12'+6'=42'	Central area: 6½'+13'+13'+13'+6½'=52'
Right area: 11'+10'+9'=30'	Right area: 6½'+13'+6½'=26'

If we then regard each individual façade and relate these three different areas to each other, the following picture emerges:

Casa del Fauno:	30' : 42' : 30' = 1 : √2 : 1
Casa di Philippus and Terentius Eudoxus:	26' : 52' : 26' = 1 : 2 : 1

The metrological analysis has revealed the underlying systematic plan of the build-up of these two façades (Fig. 28). They were both based on the same principle, dividing them into three sections, of which the outer two are identical and which are both related to the middle section, either geometrically or arithmetically.

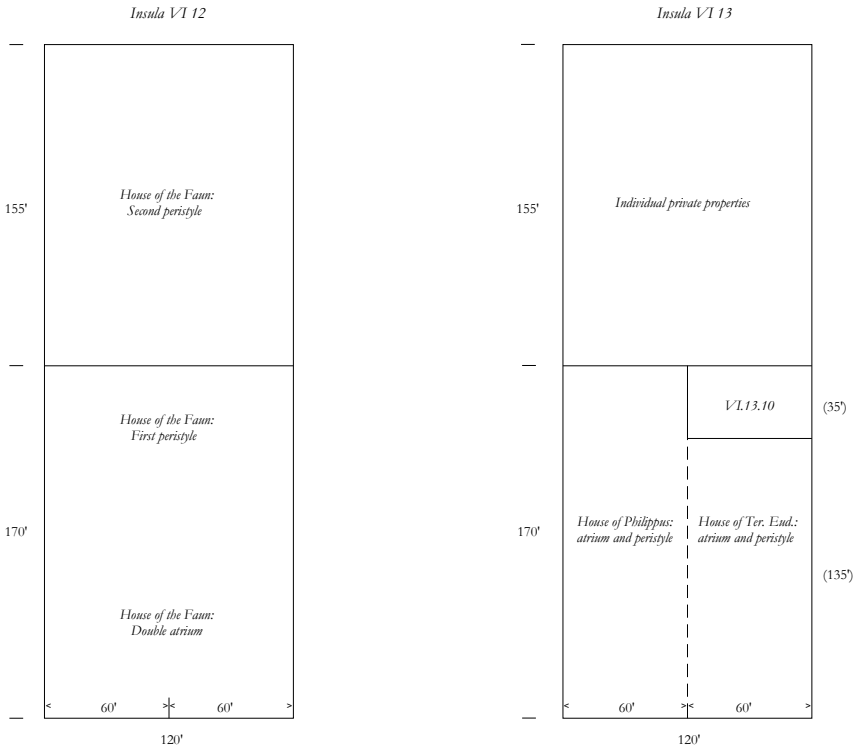


Figure 28: Insulae VI 12 and VI 13: situation of AD 79 (drawing author)

In both insulae, an area of 120' x 170' on the south façade facing the Via della Fortuna was purchased and used for a single building project, be it for the construction of a double atrium house with a peristyle-garden or for the construction of two 'twin' atrium houses with an undetermined area at the back. The remaining area for the construction of smaller properties in the northern part of both insulae measured 120' x 155'[330]. For the large private properties along the Via della Fortuna, much of the impression they made on passers-by was determined by their facades, taking up the entire width of the insulae and dividing it into two equal parts of 60'. With the original façade of the Casa del Fauno likely to have been constructed in *opus quadratum* limestone, identical to that of insula VI 13, the two neighbouring properties must have portrayed a similar 'look and feel' to those passing by. That way, the pretence of the presence of one large property behind the façade of VI 13, instead of the two independent houses that were actually present, may initially have been quite convincing.

The location of the Casa di Philippus and Terentius Eudoxus played a decisive role in the purchase of a large plot of land and the construction of 'twin' houses on that plot. The metrological analysis painted us a picture of the owners of these houses, men with high ambitions and limited funding. In their attempt to rise in the ranks of the ruling class of Pompeii, they joined forces. The purchase of a spacious plot of land on a prized location had apparently eaten up the largest part of their budget. Constructing the two houses on the basis of one single design cut down the other costs. Also, they initially lacked the means to add peristyle-gardens to the land at the back of the atrium houses, which was part of the property from the beginning. Clearly, to own this land and create a perfect picture along its façade was considered of the greatest importance. In this scene of competition between elite homeowners, ambition and pretence were the driving factors behind not only this building project, but behind the private structures of the elite in general.

---

[330] Excavations in the second peristyle of the House of the Faun show traces of earlier building activity in this part of the insula, tentatively dated to the third century BC but never fully reported: Schoonhoven 2006, 170. See Hoffmann 1986, 493-495; Bruckner 1975, 205-209.

CONCLUSIONS

New approaches in the study of Pompeian private architecture

The grand houses of Pompeii, the residences of the elite, are a reflexion of society in a Campanian town of over two millennia ago. They offer us a unique view into a past society, providing that we know how to look. Grahame's warning on the false feeling of familiarity we get when walking the streets of Pompeii is justified[331]. In essence, the Pompeian citizens walking those same streets, living in the houses, enjoying the theatre and buying their bread from the bakery on the corner, were the same kind of people we are today. However, their behaviour, daily movement patterns, politics and relationships were structured by the rules and expectations of a society profoundly different from our own. Therein lies the difficulty in reading the material remains that are a reflexion of ancient human life, for they were written in a social 'language' foreign to us.

From the earliest discoveries of Pompeii in the mid eighteenth century, there was great interest in the impressive atria and peristyles of Pompeii's elite residences. From the end of the nineteenth century, pioneers such as Fiorelli, Nissen and Mau formed the basis of our knowledge and understanding of the architectural history of these houses. Studies were mostly concerned with the analysis of particular aspects and creating typologies in different categories of material remains, until well into the twentieth century. Now, over a century after the initial scientific approach to the site, scholarly interest has shifted to questions regarding social behaviour. To answer questions on the meaning of private architecture as a reflexion of past social behaviour requires a more contextual approach to the subject. Collaboration between researchers means that specialized topics – i.e. the study of architecture, decoration, statuary etc. – are placed in a wider research framework and their results interpreted in relation to each other. Artefacts are no longer categorised in typologies but reviewed in the context of their find place and used to create insight in the daily use of a house. Similarly, decoration is no longer merely studied for its decorative qualities, mythological themes or artistic value, but also regarded as part of the experience of a house, intended to send a social message to the people using or visiting it. The current study, using metrology to analyse the atrium-peristyle houses of Pompeii, complements this range of different methods aimed at reconstructing the house in its original social and historical context. As stated at the start of this research, the metrological analysis was used to examine two different aspects of Pompeian private architecture: *design* and *meaning* or, in other words, the design methods used by the Pompeian architects and the social meaning that formed an intrinsic part of that design.

---

[331] Grahame 1997, 138.

Metrology: architectural methods and traditions

Numerous studies of public and private Greek and Roman architecture have proven that the metrological analysis of ancient structures allows us to recognise the underlying design system. The analysis of eighteen Pompeian atrium houses in this study has revealed that they were the product of a longstanding architectural tradition, within which a more or less standard form had evolved. The atrium houses in Pompeii are not an isolated example, but form part of a wide Italic architectural phenomenon, essentially based on a house form with a central court and a regular pattern of spaces surrounding that court and connected to it. In the case of the Pompeian houses, the clearly present geometrical design systems, expressed in arithmetic approximations, are proof that these houses were not the product of uneducated builders simply putting together a 'prefab' model, but instead were the result of a deliberate design, carefully devised and elaborated in detail, within the restrictions of architectural tradition. The idea that the use of arithmetic approximations to express geometric proportions in ancient building practice was only reserved for architects with the highest education who worked on large scale public buildings, as opposed to the practical division of space based on round foot measures used by uneducated builders of private properties, is a modern misperception. Using arithmetic approximations to express geometric systems was a practical and commonly used method in ancient architecture. The series of measurements offered by the approximations were readily applicable for use on site, while also being usable on a theoretical level. The clear distinction that we make between geometric and arithmetic design systems is a modern distinction that is not immediately apparent in the ancient structures themselves. In a number of the atrium houses here analysed, the symptoms of geometric and arithmetic design systems are both clearly represented in a single structure. Whereas the overall coherence of proportions within the layout of the building was usually based on one geometric figure, the general division of space, particularly in the width of the plot - into a central atrium and two side ranges - is often based on a straightforward division, based on the rational proportions 1 : 2 : 1 or 1 : 3 : 1, for example 12' : 36' : 12' or 14' : 42' : 14'. Regarding the evidence offered by the ancient structures without preconceived ideas on the use of certain design systems in particular situations, we would have to conclude that both the geometric and arithmetic methods formed part of the repertoire of the Pompeian architect or professional builder, who could and did use them both in combination without a sharp distinction.

Some houses revealed a high level of similarity in design, which could be caused by different factors, such as the standard dimensions of building plots or the standardised measures of certain spaces within the house, due to functional or material restrictions. Furthermore, the architectural tradition that was the basis of the architect's or professional builder's education also formed a restriction in the freedom to apply certain dimensions and proportions in the design. It is clear that the designs of the Pompeian atrium houses were based on established schemes of measures and proportions, which were regularly applied in houses of a similar dimension and shape. Nonetheless, the atrium houses in the current study

each reveal a unique character, due to the architect's proficient adaptation or manipulation of the symptoms of the design system. As a result, this basically rather uniform group of atrium houses actually contains a considerable level of variety. It is herein that the architect displays his particular skill, an aspect much appreciated by Vitruvius (*detractiones aut adiectiones*) and also recounted by Murru Corriga in the context of traditional Sardinian private architecture[332]. Within the limits of what was allowed, demanded and expected by society and architectural tradition, the architect and the client placed their own mark on an individual construction.

The introduction of a new architectural feature in the traditional Italic atrium house from the beginning of the second century BC, created a transformation in the layout, use and experience of the Pompeian town houses. The peristyle-garden was inspired by Hellenistic palatial architecture and integrated in the indigenous house culture as part of the wider cultural phenomenon of *Hellenization*. The fact that this form of architecture was not part of the architects' known repertoire is recognisable in the results of the metrological analyses. Contrary to the designs of the atrium houses, the peristyle-gardens were not based on set schemes of measures and proportions that were the result of a well-known architectural tradition. The dimensions and position of the peristyle as well as the layout and size of reception and dining rooms, were based on a combination of practical and aesthetical reasons. Despite the lack of uniformity between the design models used in the atrium houses and peristyle-gardens, there was often still some level of spatial unity between the two living areas. Only four atrium-peristyle houses out of the sample of eighteen were originally designed and constructed in one building project and in these cases, the atrium and peristyle form part of one coherent system of proportions. In five other cases, the architect of the peristyle-garden reused measures and proportions that formed part of the original design of the atrium house in such a way that the end result was a coherent living complex, whereby the most emphasis was placed on the proportional sequence of spaces and viewpoints along the axis of the building, aimed to create a picture of symmetry and entice the visitor's view to the far ends of the property (see Appendix: charts 1 and 2).

Metrology: social meaning

The original research goal of the metrological analysis – the recognition of design methods used in ancient architecture, both on a theoretical-mathematical level and the practical level of the building trade – has been tried and tested in various studies. From the results of the analyses of my MA-thesis, I had the presumption that this particular analytical method could also add information to our knowledge and understanding of the social meaning of the ancient house. This presumption was supported by Vitruvius (VI, 5) who expressly reminds his readers that the design of a private structure needed to fit the status of its owner. To my knowledge, using the metrological analysis to say something about the social meaning of a house was not attempted prior to the current study. I tested my

---

[332] *De architectura* VI 2, 1; Murru Corriga 1994.

presumptions on the possibilities to use the metrological analysis to participate in the current discussions on social meaning and history of private Pompeian architecture in a case-study focussing on two houses in the sample, the Casa di Philippus (VI 13, 2) and the Casa di M. Terentius Eudoxus (VI 13, 6)[333]. The positive results from this case-study were an incentive to further explore this approach here.

In a competitive society such as that of Pompeii, the house of a noble man could 'make or break' him. If designed, constructed, furnished and decorated correctly, it was a powerful tool to not only reflect his status, but also contribute to it. What we see nowadays in the standing structures of AD 79, is the result of a complex process, starting with the purchase of a plot of land, instructing an architect to design a house, and having it decorated and furnished appropriately. The design itself is also the result of an elaborate process consisting of different phases, choices and adjustments, which could be of a practical, economical or social nature. It is difficult to reconstruct these choices, made by the architect or client over 2000 years ago, but some aspects in the designs of the Pompeian house offer us a view into that process and the meaning behind it.

One of the strongest features in the layout and experience of the atrium-peristyle house is the visual axis, creating an uninterrupted view from the entrance to the house until the back of the garden. The axial view, or 'deep view', is frequently brought to the attention in discussions on the Pompeian house[334]. The meaning behind the axial view is generally accepted to be a reflexion of the competitive nature of the elite, who were intent on leaving a visitor to the house with the best possible impression. Even those passing by on the street could enjoy this particular architectural feature, as the doors to the street were presumably left open for at least part of the day. The metrological analyses of the current study confirm the existing ideas on the strong presence of the axial order in the design of the atrium-peristyle house. In fact, in many cases this view is not simply present and framed by windows or columns, but forms part of the architect's design, who made deliberate choices in positioning elements that interrupt the axial view, such as the impluvium basin and the front and back rows of columns of the peristyle. The position of these elements was often a direct reflection of the original design modules and proportions, and divided the physical space into a symmetrical sequence drawing the eye from one point to the next. The fact that the axial view was often an intricate part of the architect's concept and thus a deliberate factor in the overall design, leads to the assumption that it was more than just a way to attract the viewers' attention. With the addition of the peristyle-garden to the atrium house - a foreign element with no links to the indigenous architectural tradition – the axial view may have been used deliberately to enforce a sense of spatial integration and logical succession of space within the total new layout. How much of this spatial sequence was revealed to a visitor was

333 Van Krimpen-Winckel 2006.
334 See for example: Drerup 1959, Bek 1980, Martin Watts 1987, Clarke 1991, Wallace-Hadrill 1994.

the owner's choice, who could manipulate the space exposed to open view with the use of curtains and folding doors.

On a more detailed level, the metrological analysis can inform us on the choices made in a particular design and construction process, which could be instigated by matters of a social nature. In the case of two houses that were constructed in one building project and based on one design, the Casa di Philippus and the Casa di M. Terentius Eudoxus, the metrological analysis revealed that the particular choices made were driven by two factors: competitiveness and a lack of funding. Positioned in one of the most desired spots in the Pompeian street network, on the Via della Fortuna, the purchase of a large building plot (120'x170') was only feasible for the wealthiest of Pompeian society. In fact, this was exactly the plot that was originally purchased by the first owner of the Casa del Fauno – direct neighbour to the two houses here discussed – for the construction of a double atrium house and peristyle-garden. In an attempt to rival with not only this powerful man, but also with the concentration of other elite houses in the same street, two closely related citizens joined forces and together purchased an equally large plot of land. Clearly, this left them with not much funding, as they then had to construct both atrium houses, which always functioned as separate properties, on the basis of one design, resulting in identical properties executed in a mirror image. Contrary to their neighbour the Faun, they were not in a position to construct peristyle-gardens at the back for quite some time after the completion of the atrium houses. In fact, even when the peristyle-gardens were finally built, the land at the back of the Casa di M. Terentius Eudoxus had already been partially built over by a small independent house (VI 13, 10)[335]. Rather than place emphasis on the back of their properties, the owners of the Casa di Philippus and Terentius Eudoxus put all their faith in the front of their homes. With the proportional layout of their façades - interspersed by shop openings and fauces - showing a close resemblance to that of the Casa del Fauno, their primary concern was to leave all those passing by with an image of grandeur that far exceeded their actual status in society.

Contrary to the example of the building project of the Casa di Philippus and Terentius Eudoxus, where the owners were hindered in the execution of their ambitions by a lack of monetary funds, the metrological analysis of the Casa del Menandro tells another unique story[336]. The owner of this house clearly possessed more than enough wealth to expand his original property at the cost of his neighbours, until he owned one of the largest and most conspicuous residences in town. Often quoted in modern literature for its refined elements of high class Pompeian society – i.e. the quality decorations, impressive entrance, private bath suite and series of framed visual sight lines – this house has been given a reputation of a fine example of a Pompeian elite domus. Surprisingly, the Casa del Menandro was the only house in the sample of eighteen that revealed no underlying system of design, neither in the atrium house nor in the peristyle-garden. In a world where the social behaviour of the elite

[335] See Van Krimpen-Winckel 2006.
[336] See Part II, 8-18.

was bound to strict rules and regulations, constantly scrutinised by society at large, and where the atrium house was part of an indigenous inheritance, also bound by architectural traditions and guidelines, the construction of an elite house without a commissioned design by an architect was an exception to the rule. What the motives were exactly behind this choice remains unclear. Maybe the owner of this house fancied himself capable of taking on an architect's tasks, following the general lines of the known model but clearly not educated in the theoretical-mathematical aspects of the trade. We have to wonder how forgiving the ruling class was of this *faux-pas* and whether the established elite would seriously consider the acceptance of this man who seems to have represented the *nouveau riche*.

Metrology: an investigative tool

The metrological analysis of ancient structures has been proven to be a valuable tool and an addition to the existing range of research methods that are available to us. The analysis of eighteen atrium-peristyle houses, both individually and in the wider context of the city and society, has revealed information that not only corresponds to what we already know of the architectural history and social meaning of these houses, but also adds new information to the current discussion from a specific viewpoint. The metrological analysis as a research method is perhaps most valuable because of its non-destructive character, while still allowing us to extract a wealth of information from the standing structures. Especially in situations such as that in Pompeii, where excavations must still remain small-scale, this methods offers another way to create a broader and more profound picture of the architectural and social history.

Furthermore, the combined research of the building history and metrological analysis, resulting in the recognition of the original property boundaries and layout of a house, offers us information of an historical depth that is otherwise only obtainable through excavation. Studies of decoration or artefacts and analyses of the ground plan through methods such as space syntax, are all concerned with the final phase of the history of these houses. The reconstruction of the original design and layout of a property offers us a view of the initial process that led up the construction of a house and the subsequent changes during its extended period of use, together forming its social history.

In Pompeii, the elite atrium house was a symbol for a longstanding Italic architectural and cultural tradition, representing the highest social class. The design of that house reflected those values and norms. On the one hand, the structural division of space in these houses conditioned the behaviour of its inhabitants and visitors, while on the other hand successive generations of users re-invented, manipulated and adapted that space to fit their changing needs and expectations, of which the addition of the peristyle-garden is perhaps the best example.

APPENDIX

Chart 1: property areas, peristyle orientation and building phases.
Chart 2: atrium and peristyle designs: dimensions, methods and relations.

Chart 1: property areas, peristyle orientation and building phases[337].

HOUSE NAME	AREA ATRIUM-PERISTYLE* (In square Oscan feet)	AREA ATRIUM HOUSE (In square Oscan feet)	AREA PERISTYLE-GARDEN (In square Oscan feet)	TRANSVERSAL PERISTYLE	LONGITUDINAL PERISTYLE	CONSTRUCTION IN 1 PHASE	CONSTRUCTION IN 2 PHASES ON ORIGINAL PLOT	CONSTRUCTION IN 2 PHASES ON NEW LAND
DOMUS CORNELIA (VIII 4, 15)	8.835	4.200	4.635		X			X
CASA DELLA CALCE (VIII 5, 28)	7.770	3.480	4.290	X				X
CASA DI PHILIPPUS (VI 13, 2)	10.065	4.965	5.100		X		X	
CASA DI M. TER. EUDOXUS (VI 13, 6)	10.065	4.965	5.100		X		X	
CASA DEL PRINC. DI MONT. (VII INS. OCC. 12-15)	7.200	4620 (Atrium 13)	2.580	X		X		
CASA DI N. POP. PRISCUS (VII 2, 20)	9.970	5.030	4.940	X				X
CASA DEI CAP. FIGURATI (VII 4, 57)	10.500	5.250	5.250		X	X		
CASA DEL LABIRINTO (VI 11, 8-10)	13.390	4960 (Tetrastyle atrium)	8.430		X			X
VI 13, 13	7.450	5.200	2.250	X			X	
CASA DEL MENANDRO (I 10, 4)	10.100	4.200	5.900		X			X
CASA DEL TORELLO (V 1, 7)	7.433	5.340	2.093	X			X	
CASA DI L. CAEC. IUCUNDUS (V 1, 26)	7.670	4.400	3.270	X			X	
CASA DEL CHIRURGO (VI 1, 10)	5.000	3.450	1.550	Single porticus			X	
CASA DI PANSA (VI 6, 1)	11.710	4.350	7.360		X	X		
CASA DEL CINGHIALE (VIII 3, 8)	13.500	6.750	6.750		X	X		
CASA DEL GALLO (VIII 5, 2-5)	13.300	7755 (Atrium 2)	5.545		X			X
CASA DI M. EP. RUFUS (IX 1, 20)	11.860	6.860	5.000	Single porticus				X
CASA DI M. OB. FIRMUS (IX 14, 2-4)	14.990	7550 (Atrium 4)	7440 (Designed area)	X				X

[337] All measurements used are as true as possible to the real situation of the built structures.

Chart 2: atrium and peristyle designs: dimensions, methods and relations[338]

HOUSE NAME	DIMENSIONS ATRIUM DESIGN (In Oscan feet)	DIMENSIONS PERISTYLE DESIGN (In Oscan feet)	METHOD OF DESIGN ATRIUM	METHOD OF DESIGN PERISTYLE	SPATIAL INTEGRATION BETWEEN ATRIUM AND PERISTYLE
DOMUS CORNELIA (VIII 4, 15)	28 x 40	28 x 60	geom.	geom. (copied from atrium)	X
CASA DELLA CALCE (VIII 5, 28)	28 x 40	40 x 56	geom.	geom. (copied from atrium)	X
CASA DI PHILIPPUS (VI 13, 2)	32 x 46	16 x 34	geom.	arithm.	X
CASA DI M. TER. EUDOXUS VI 13, 6)	32 x 46	27 x 36	geom.	arithm.	
CASA DEL PRINC. DI MONT. (VII INS. OCC. 12-15)	32 x 46	23 x 32	geom./arithm. (atrium 13)	geom./arithm.	X
CASA DI N. POP. PRISCUS (VII 2, 20)	36 x 51	40 x 60	geom./arithm.	arithm.	
CASA DEI CAP. FIGURATI (VII 4, 57)	36 x 51	45 x 57	geom./arithm.	arithm.	X
CASA DEL LABIRINTO (VI 11, 8-10)	42 x 42	56 x 68	geom. (Tetr. Atrium)	geom.	X
VI 13, 13	42 x 42	24 x 40	geom./arithm.	arithm.	
CASA DEL MENANDRO (I 10, 4)	26 x 37	45 x 58	No formal design	No formal design	
CASA DEL TORELLO (V 1, 7)	32 x 48	30 x 32	geom./arithm.	geom./arithm. (copied from atrium)	X
CASA DI L. CAEC. IUCUNDUS (V 1, 26)	30 x 42	30 x 40	geom.	arithm.	
CASA DEL CHIRURGO (VI 1, 10)	30 x 35	Single porticus	geom.	No formal design	
CASA DI PANSA (VI 6, 1)	34 x 52	27 x 45	geom.	arithm.	X
CASA DEL CINGHIALE (VIII 3, 8)	28 x 48	28 x 42	geom.	geom.	X
CASA DEL GALLO (VIII 5, 2-5)	36 x 61 1/2	27 x 45	geom. (atrium 2)	arithm.	
CASA DI M. EP. RUFUS (IX 1, 20)	42 x 63	Single porticus	geom.	No formal design	
CASA DI M. OB. FIRMUS (IX 14, 2-4)	50 x 62	46 (left port.) x 74 x 32 (right port.)	geom. (Tetr. Atrium)	copied from Tusc. and Tetr. Atrium	

[338] All measures used are based on the ideal measures of design.

BIBLIOGRAPHY

Adam, J.P. 1994. *Roman building Techniques and Materials*. Bloomington.

Adam, J.P. Building materials, construction techniques and chronologies, in: Dobbins, J.J. & P.W. Foss (eds.). *The world of Pompeii*, 98-113. London; New York.

Allison, P.M. 1992. The relationship between wall-decoration and room type in Pompeian houses: a case study of the Casa della Caccia Antica, in: *JRA 4*, 235-249.

Allison, P.M. 1994. Room use in Pompeian houses, in: Descoeudres, J.P. et al, *Pompeii revisited: the life and death of a Roman town*, 82-89. Sydney.

Allison, P.M. 2001. Using the material and written sources: turn of the millennium approaches in Roman domestic space, in: *AJA 105*, 181-208.

Allison, P.M. 2007. Domestic spaces and activities, in: Dobbins, J.J. & P.W. Foss (eds.). *The world of Pompeii*, 269-278. London; New York.

Anderson, J.C. 1997. *Roman Architecture and Society*. Baltimore.

Andreau, J. 1973. Remarques sur la société Pompéienne (à propos des tablettes de L. Caecilius Jucundus), in : *Dialoghi di Archeologia 7*, 213-254.

Andreau, J. 1974. *Les Affaires de Monsieur Jucundus*, collection de l'Ecole Française de Rome 19, Rome.

Angioni, G. & A. Sanna (eds.) 1988. *L'architettura popolare in Italia*. Bari.

Ault, B.A. & L.C. Nevett (eds.) 2005. *Ancient Greek houses and households: chronological, regional and social diversity*. Philadelphia.

Ayoagi, M. 1977. *La Casa della Nave Europa a Pompei*. Tokyo.

Baldacci, O. 1952. *La casa rurale in Sardegna*. Firenze.

Bastet, F.L. & M. de Vos 1979. *Proposta per una classificazione del terzo stile pompeiano (* Arch. Stud. Nederlands Instituut te Rome IV*)*. Den Haag.

Bek, L. 1976. Antithesis, a Roman attitude and its changes as reflected in the concept of Architecture from Vitruvius to Pliny the Younger, in: *Studia Romana in honorem Petri Krarup septuagenarii*, 154-166.

Bek, L. 1980. Towards paradise on earth: modern space conception in architecture: a creation of renaissance humanism, in: *Analecta Romana Instituti Danici, suppl. 9*.

Berry, J. 1997a. Household artefacts: towards a re-interpretation of Roman domestic space, in: Laurence, R. & A. Wallace-Hadrill (eds.), *Domestic space in the Roman world: Pompeii and beyond*, 183-195. Portsmouth.

Berry, J. 1997b. The conditions of domestic life in Pompeii in ad 79: a case study of houses 11 and 12, insula 9, region I, in: *BSR 65*, 103-125. London.

Berry, J. (ed.) 1998. *Unpeeling Pompeii*. Milan.

Berry, J. 2007. Instrumentum domesticum – a case study, in: Dobbins, J.J. & P.W. Foss (eds.). *The world of Pompeii*, 292-301. London; New York.

Beyen, H.G. 1939. Die antike Zentralperspective, in: *AA*, 47-72.

Blanton, R.E. 1994. *Houses and households-a comparative study*. Oxford.

Boëthius, A. 1939. Vitruvius and the Roman architecture of his age, in: *Dragma, Festschrift M.P. Nilsson* (*Acta Instituti Romani Regni Sueciae, Series Altera I)*, 114-143. Lund.

Bon, S.E. and R. Jones (eds.) 1997. *Sequence and Space in Pompeii*. Oxford.

Bonghi Jovino, M. et al. 1984. *Ricerche a Pompei. L'insula 5 della Regio VI dalle origine al 79 d. C. I (campagne di scavo 1976-1979)*. Rome.

Broadbent, G., Bunt, R. & Jencks, C. (eds.) 1980. *Signs, symbols and architecture*. New York.

Brödner, E. 1989. *Wohnen in der Antike*. Darmstadt.

Brown, F. E. 1980. *Cosa: The making of a Roman town*. Ann Arbor: University of Michigan press.

Bruckner, A. 1975. Zu der Keramik aus der Casa del Fauno, in: B. Andreae & H. Kyrieleis (eds.), *Neue Forschungen in Pompeji*, 205-209. Recklinghausen.

Bruno, V.J. 1970. A town house at Cosa, in: *Archaeology 23*, 232-241.

Bruno, V.J. & T. Scott. 1993. *Cosa IV, The houses (Memoirs of the American Academy in Rome XXXVIII)*. Rome.

Cahill, N. 2002. *Household and city organisation at Olynthus*. Yale.

Callebat, L. 1989. Organisation et structures du De architectura de Vitruve, in: *Munus non Ingratum*, Proceedings of the International Symposium on Vitruvius' *De architectura* and the Hellenistic and Republican architecture, Leiden 20-23 January 1987, 34-38. Leiden.

Callebat, L. 1994. Rhétorique et architecture dans le De architectura, in: *Le projet de Vitruve*, 31-46.

Callebat, L. 2004. *Vitruve. De l'architecture, Livre VI*. Paris.

Carrington, R.C. 1933. Notes on the building materials of Pompeii, in: *JRS 23*, 125-138.

Castrèn, P. 1975. *Ordo Populusque Pompeianus: polity and society in Roman Pompeii*. Acta Instituti Romani Finlandiae, Vol. VIII. Roma.

Carafa, P. 1997. What was Pompeii before 200 B.C? Excavations in the House of Joseph II, in the Triangular Forum and in the House of the Wedding of Hercules, in: Bon, S.E. & R. Jones (eds.) *Sequence and space in Pompeii*, 13-32. Exeter.

Carafa, P. 2007. Recent work on early Pompeii, in: Dobbins, J.J. & P.W. Foss (eds.). *The world of Pompeii*, 63-72. London; New York.

Carandini, A. 1990. Domus aristocratiche sopra le mura e il pomerio del Palatino, in: Cristofani, M., Quilici, L. & Quilici Gigli, S. (eds.). *La grande Roma dei Tarquini*, 97-99. Novara.

Carettoni, G., A.M. Colini, L. Cozza & G. Gatti, 1960. *La Pianta Marmorea di Roma Antica*. Rome.

Carsten, J. & S. Hugh-Jones (eds.) 1995. *About the house – Lévi Strauss and beyond*. Cambridge.

Castrèn, P. 1983. *Ordo populusque Pompeianus: polity and society in Roman Pompeii* (2nd edition). Rome.

Chiaramonte Treré, C. 1990. "Sull'origine e lo sviluppo dell"architettura residenziale di Pompei sannitica". *ACME. Annali della Facoltà di Lettere e Filosofia dell"'università degli studi di Milano 43*, 5-34; and, more briefly: "Un contributo di antichità italiche dai recenti

scavi, Pompei, 4 nov. 1988", in: *Ercolano 1738-1988. 250 anni di ricerca archeologica*, 543-550.

Ciarallo, A. & E. De Carolis (eds.) 1999. *Homo Faber: natura, scienza e tecnica dell'antica Pompei*. Naples.

Clarke, J. 1991. *The houses of Roman Italy, 100 BC-AD 250. Ritual, space and decoration*. Berkeley.

Clarke, J. 2007. Domestic decoration: mosaics and stucco, in: Dobbins, J.J. & P.W. Foss (eds.). *The world of Pompeii*, 323-335. London; New York.

Coarelli, F. 1989. La casa del'aristocrazia romana secondo Vitruvio, in: Geertman, H. & J.J. de Jong (eds.) *Munus non ingratum*. Proceedings of the International Symposium on Vitruvius' *De architectura* and the Hellenistic and Republican architecture, Leiden 20-23 January 1987, 289-309. Leiden.

Colonna, G. 1986. Urbanistica e architettura, in: Pallottino, M. et al. *Rasenna. Storia e civiltà degli Etruschi*, 371-530. Milan.

Coppa, M. 1969. *Storia dell'urbanistica dalle origini all'ellenismo*. Turin.

Cornell, T.J. & K. Lomas 1995. *Urban society in Roman Italy*. London.

Cuisenier, J. 1991. *La maison rustique: logique social et composition architectural*. Paris.

D'Ambrosio, A. & S. De Caro 1989. Un contributo all'architettura e all'urbanistica di Pompei in età ellenistica. I saggi nella casa VII, 4. 62. *AION II*, 173-215.

De Caro, S. 1991. La città sannitica, urbanistica e architettura, in: Zevi, F. (ed.) *Pompei I*, 23-46. Naples.

Della Corte, M. 1965. *Case ed abitanti di Pompei*. Third edition. Naples.

Dentamaro, F. 2003. Pompei, Casa di Cecilio Giocondo: un'ipotesi di ricostruzione delle fasi edilizie mediante analisi stratigrafica delle strutture murarie, in: *Rivista di Studi Pompeiani 12-13*, 131-141.

Dexter, C.E. 1975. *The casa di L. Cecilio Giocondo in Pompeii*. PhD, Duke University.

Dickmann, J.-A. 1997. The peristyle and the transformation of domestic space in the Roman world, in: Laurence, R. & A. Wallace-Hadrill (eds.), *Domestic space in the Roman world: Pompeii and beyond*, 121-137. Portsmouth.

Dickmann, J.-A. & F. Pirson 1998. Repräsentatives Wohnen und kommerzielle Nutzung innerhalb eines Architekturkomplexes in Pompeji: Die Casa dei Postumii (VIII 4, 4.49) und ihre Insula, in: *Römische Mitteilungen 105*, 409-423.

Dickmann, J.-A. 1999. *Domus frequentata. Anspruchsvolles Wohnen im Pompejanischen Stadthaus*. Munich.

Dickmann, J.-A. & F. Pirson 2002. La Casa dei Postumii in Pompeji und ihre insula, in: *Römische Mitteilungen*, 243-316.

Dobbins, J.J. & P.W. Foss (eds.) 2007. *The world of Pompeii*. London; New York.

Donati, L. 1994. *La Casa dell' Impluvium: architettura Etrusca a Roselle*, 89-94. Rome.

Drerup, H. 1957. *Zum Ausstattungsluxus in der römischen Architektur, ein forgeschichtlicher Versuch*. Münster.

Drerup, H. 1959. Bildraum und Realraum in der römischen Architektur, in: *Römische Mitteilungen, Abt. 66*, 147-174.

Drinkwater, J.F. and A. Drummond 1993. *The World of Romans*. Oxford.

Dunbabin, K.M.D. 1995. Houses and households in Pompeii, in: *JRA 8*, 387-390.

Dwyer, E. 1991. The Pompeian atrium house in theory and practice, in: Gazda 1991, 25-48. Michigan.

Eschebach, H. 1970. *Die städtebauliche Entwicklung des antiken Pompeji*, Heidelberg.

Eschebach, H. 1982. Die Casa di Ganimede in Pompeji VII 13, 4, in: *Römische Mittteilungen 89*, 229-436.

Eschebach, H. 1984. *Die Artzhäuser in Pompeji* (*Antike Welt Sondernummer*. Feldmeilen.

Eschebach, L. (ed.) 1993. *Gebäudeverzeichnis und Stadtplan der antiken Stadt Pompeji*. Cologne; Weimar; Wien.

Evans, E.M. 1978. A group of atrium houses without side rooms in Pompeii, in: *Papers in Italian archaeology I* (BAR int. Series 41), 175-191. Oxford.

Evans, E.M. 1980. *The atrium complex in the houses of Pompeii*, PhD. University of Birmingham.

Fiorelli, G. 1882. *Pompeianorum Antiquitatum Historia*. Naples.

Fiorelli, G. 1873. *Gli scavi di Pompei del 1861 al 1872*. Naples.

Fiorelli, G. 1875. *Descrizione di Pompei*. Naples.

Fleury, Ph. 1990. *Vitruve. De l'architecture, Livre I*. Paris.

Franciosi, F. 1977. L'irrazionalità nella matematica greca archaica, in: *Bollettino dell'Istituto di Filologia Greca*, suppl. 2. Rome.

Frederiksen, M. 1984. *Campania*. Roma.

Frey, L. 1987. *Approximations d'incommensurables dans l'architecture pompéienne*. Provence.

Frey, L. 1989. Données architecturales et hypothèses sur la mathématique pré-euclidienne, in: Geertman, H. & J. J. de Jong (eds.). *Munus non Ingratum*, 90-99.

Frey, L. 1990. Mediétés et approximations chez Vitruve, in: *Revue Archéologique*, 285-330.

Frey, L. 1992. Pour un modèle du chapiteau ionique vitruvien, in: *Revue Archéologique*, 37-63.

Frey, L. 1994. La transmission d'un canon: les temples ioniques, in: *Le projet de Vitruve*, 139-170.

Frézouls, E. 1989. Fondements scientifiques, armature conceptuelle et praxis dans le De Architectura, in : Geertman, H. & J.J. de Jong (eds.) *Munus non ingratum*. Proceedings of the International Symposium on Vitruvius' *De architectura* and the Hellenistic and Republican architecture, Leiden 20-23 January 1987, 39-48. Leiden.

Fulford, M. & A. Wallace-Hadrill 1999. Towards a histoty of pre-Roman Pompeii: excavations beneath the House of Amarantus (I 9, 11-12), 1995-1998, in: *Papers of the British School at Rome 67*, 37-144.

García y García, L. 2006. *Danni di guerra a Pompei: una dolorosa vicenda quasi dimenticata: con numerose notizie sul "museo Pompeiano" distrutto nel 1943*. Rome.

Gazda, E.K. (ed.) 1991. *Roman art in the private sphere. New perspectives on the architecture and decor of the domus, villa and insula*. Michigan.

Geertman, H. 1984a. Geometria e aritmetica in alcune case ad atrio pompeiane, in: *Babesch 59*, 31-52.

Geertman, H. 1984b. Vitruvio e i rapporti numerici, in: *Babesch 59*, 53-62.

Geertman, H. 1989. La progettazione architettonica in templi tardo-reppublicani e nel *De architectura*: componenti italiche e ellenistiche, in: Geertman, H. & J.J. de Jong (eds.) *Munus non ingratum*. Proceedings of the International Symposium on Vitruvius' *De architectura* and the Hellenistic and Republican architecture, Leiden 20-23 January 1987, 154-177. Leiden.

Geertman, H. 1993. Vitruvio, la realtà architettonica e la progettazione di porte templari in: *Babesch 68*, 209-245.

Geertman, H. 1994. *Teoria e attualità della progettistica di Vitruvio*, in: Gros, P. 1994, 1-24. Rome.

Geertman, H. 1997. De architectura als archeologische bron: text en context van Vitruvius' theorie en praktijk, in: Rolf, R. (ed), *Vitruviuscongres (Heerlen 13-15 oktober; Maastricht 25 oktober 1995)*, 17-24. Heerlen.

Geertman, H. 2001. Lo studio della città antica. Vecchi e nuovi approcci, in: Guzzo, P.G. (ed.) *Pompei: scienza e società* (250 anniversario degli scavi di Pompei. Convegno internationale, Napoli, 25-27 novembre 1998), 131-135. Milan.

Geertman, H. 2007. The urban development of the pre-Roman city, in: Dobbins, J.J. & P.W. Foss (eds.). *The world of Pompeii*, 82-97. London; New York.

Grahame, M. 1997. Public and Private in the Roman house: the spatial order of the Casa del Fauno, in: in: Laurence, R. & A. Wallace-Hadrill (eds.), *Domestic space in the Roman world: Pompeii and beyond*, 183-195. Portsmouth.

Grahame, M. 2000. *Reading space: social interaction and identity in the houses of Roman Pompeii: a syntactical approach to the analysis and interpretation of built space* (BAR International Series 886). Oxford.

Granger, F. 1934. *Vitruvius. De architectura*, book VI, Loeb Edition. London.

Green, D., Haselgrove, C. and Spriggs, M. (eds.) 1978. *Social organisation and settlement (*BAR International series, suppl. 47). Oxford.

Gros, P. 1976. Nombres irrationels et nombres parfaits chez Vitruve, in *MEFRA 88*, 669-704.

Gros, P. 1990. *Vitruve. De l'architecture*, Livre III, Les Belles Lettres. Paris.

Gros, P. (ed.) 1994. *Le projet de Vitruve. Objet, destinataires et réception du De architectura.* Actes du colloque international organisé par l'École Française de Rome, l'institut de recherche sur l'architecture antique du CNRS et la Scuola normale superiore de Pise, Rome 26-27 mars 1993. Rome.

Gros, P. 2001. *L'Architecture Romaine : du début de IIIe siècle av. J.-C. à la fin du Haut Empire, 2 (maisons, palais, villas et tombeaux).* Paris.

Haan, de N. 1996. Die Wasserversorgung der Privatbäder in Pompeji, in: *BABesch suppl. 4*, 59-65.

Haan, de N., K. Peterse, S. Piras & F. Schipper 2005. The Casa degli Scienzati (VI 14, 43): elite architecture in fourth century BC Pompeii, in: Guzzo, P.G. & M.P. Guidobaldi (eds.) *Nuove ricerche archeologiche a Pompei ed Ercolano* (Atti del Convegno internazionale, Roma 28-30 novembre 2002), Studi della SAP 10, 240-256. Naples.

Hallier G. 1989. Entre les règles de Vitruve et la réalité archéologique: l'atrium toscan, in: Geertman, H. & J.J. de Jong (eds.) *Munus non ingratum.* Proceedings of the International Symposium on Vitruvius' *De architectura* and the Hellenistic and Republican architecture, Leiden 20-23 January 1987, 194-211. Leiden.

Hales, S. 2003. *The Roman house and social identity*. Cambridge.

Haselgrove, C. 1995. Social and symbolic order in the origins and layout of Roman villas in northern Gaul, in: Metzler, J., M. Millet, N. Roymans & J. Slofstra (eds.), *Integration in the early Roman west: the role of culture and ideology*, 77-90. Luxemburg.

Heath, Th. 1921. *A history of Greek mathematics*. London [New York 1981].

Hoepfner, W. (ed.) 1984: *Wohnungsbau im Altertum*. Berlin.

Hoepfner, W. & E.-L. Schwandner 1986. *Haus und Stadt im klassischen Griechenland.* Munich.

Hoffmann, A. 1980. Ein Beitrag zum Wohnen in vorrömischen Pompeji, in: *Architectura 10*, 1-14.

Hoffman, A. 1984. L'architettura, in: Zevi, F. (ed.). *Pompei 79*, 97-118. Naples.

Jashemski, W.F. 1979. *The gardens of Pompeii, Herculaneum and the Villas destroyed by Vesuvius*. New York.

Jones, R. & D. Robinson 2004. The making of an elite house at Pompeii, in: *Journal of Roman Archaeology 17*,107-130.

Jones, R. & D. Robinson. 2007. Intensification, heterogeneity and power in the development of insula VI 1, in: Dobbins, J.J. & P.W. Foss (eds.). *The world of Pompeii*, 389-406. London; New York.

Jong, de J.J. 1988. The temple of Athena-Polias at Priene and the temple of Hemithea at Kastabos, in *BABesch 63*, 129-137.

Jong, de J.J. 1989. Greek mathematics, Hellenistic architecture and Vitruvius' De architectura, in: Geertman, H. & J.J. de Jong (eds.) *Munus non ingratum.* Proceedings of the International Symposium on Vitruvius' *De architectura* and the Hellenistic and Republican architecture, Leiden 20-23 January 1987, 100-113. Leiden.

Jongman, W. 1988. *The economy and society of Pompeii.* Amsterdam.

Kent, S. (ed.) 1990. *Domestic architecture and the use of space: an interdisciplinary cross-cultural study*. Cambridge University Press.

Kind, de R.E.L.B. 1998. *Houses in Herculaneum: a new view on the town planning and the building of insulae III and IV*. Amsterdam.

Krimpen-Winckel, N. van 2003. Building history and methods of design of atrium houses in the social context of Pompeii, in: *AIACNews 36: incontri dell'A.I.A.C. 14 aprile 2003, Roma* (online publication).

Krimpen-Winckel, N. van 2006. Pompeian twins: design and building of the Casa di Philippus (VI 13, 2) and the Casa di M. Terentius Eudoxus (VI 13, 6), in: *BABesch 81*, 135-168.

Laidlaw, A. & J. Packer. 1971. Excavations in the house of Sallust in Pompeii, in: *AJA 75*, 206-7.

Laidlaw, A. 1985. *The First Style in Pompeii: painting and architecture*. Rome.

Laidlaw, A. 1994. Excavations in the Casa di Sallustio, Pompeii: a preliminary assessment, in: Scott, R.T. & A.R. Scott (eds.) *Eius Virtutis Studiosi: Classical and Post-classical studies in memory of Frank E. Brown (1909-1988)*, 217-231. Washington D.C.

La Rocca, E., De Vos, M. and A. De Vos. 1994. *Pompei*. Milano

Laurence, R. 1993. Pompeii : the Casa del Marinaio and its history, in : *Journal of Roman Studies 83*, 227-229.

Laurence, R. 1994. *Roman Pompeii: space and society*. London; New York.

Laurence, R. 1995. The organization of space in Pompeii, in : Cornell, T.J. & K. Lomas (eds.)1995. *Urban society in Roman Italy*, 63-79. London.

Laurence, R. 1997. Space and text, in: Laurence, R. & A. Wallace-Hadrill (eds.). *Domestic space in the Roman world: Pompeii and beyond*, 7-15. Portsmouth.

Leach, E.W. 1978. Does Space syntax really "constitute the social"?, in: Green, D., C. Haselgrove & M. Spriggs (eds.), *Social Organisation and Settlement, BAR Int. Series Suppl. 47*, 385-401.

Leach, E.W. 1992. Reading signs of status: recent books on Roman art in the private sphere, in: *AJA 96*, 551-557.

Ling, R. 1997. *The insula of the Menander at Pompeii. Volume 1: the structures*; *Volume 2: the decorations*. Oxford.

Locock, M. (ed.) 1994. *Meaningful architecture: social interpretations of buildings*. Aldershot.

Lomas, K. 1996. *Roman Italy, 338 BC-AD 200. A sourcebook*. London.

Maaskant-Kleibrink, M. 1991. Early Latin settlement-plans at Borgo le Ferriere (*Satricum*): a reading with 19th century maps, in: *BABesch 66*, 51-115.

Maiuri, A. 1944-45. Saggi nella Casa di Fontana Grande e in altre case pompeiane, in: *Notizie degli Scavi di Antichità*, 130-159. Naples.

Maiuri, A. 1951. *La casa a Pompei*. Naples

Maiuri, A. 1973. *Alla ricerca di Pompei pre-romana*. Naples.

Mau, A. 1882. *Geschichte der decorativen Wandmalerei in Pompeji*. Berlin.

Mau, A. 1908. *Pompeji in Leben und Kunst*. Leipzig.

Mansuelli, G.A. 1963. La casa etrusca di Marzabotto. Costatazioni nei nuovi scavi, in *Römische Mitteilungen 70*, 44-62.

Martin Watts, C. 1987. *A pattern language for houses at Pompeii, Herculaneum and Ostia*. PhD. University of Texas.

McKay, A.G. 1975. *Houses, villas and palaces in the Roman world*. London.

Miele, F. 1989. La casa a schiera I, 11, 16, un esempio di edilizia privata a Pompei, in: *Rivista di Studi Pompeiani III*, 165-184.

Mols. S.T.A.M. 1999. *Wooden furniture in Herculaneum: form, technique and function*. Amsterdam.

Moormann, E. 2001. Carandini's royal houses at the foot of the Palatine: fact or fiction?, in: *BABesch 76*, 209-212.

Mossa, V. 1957. *Architetture domestica in Sardegna*. Cagliari.

Murru Corriga, G. 1994. Saperi e pratiche produttive dell'architettura domestica tradizionale, in: Copez, R. (ed.), *Architettura senza architetti*, 41-68. Cagliari.

Naerebout, F.G. & H.W. Singor 2001. *De oudheid: Grieken en Romeinen in de context van de wereldgeschiedenis*. Amsterdam.

Nappo, S.C. 1993-1994. Alcuni esempi di tipologie di case popolari della fine III, inizio II secolo a.C. a Pompei, in*: Rivista di Studi Pompeiani VI*, 77-104.

Nappo, S.C. 1993. "Pompei: la casa Regio I, ins. 20, n. 4 nelle sue fasi. Considerazioni e problemi", in: *Ercolano 1738-1988. 250 anni di ricerca archeologica*, 667-676, Rome.

Nappo, S.C. 2007. Houses of Regions I and II, in: Dobbins, J.J. & P.W. Foss (eds.). *The world of Pompeii*, 323-335. London; New York.

Nissen, H. 1877. *Pompejanische Studien zur Städtekunde des Altertums*. Leipzig

Nissen, H. 1892. *Griechische und Römische metrologie*. Munich.

Overbeck, J. and A. Mau 1884. *Pompeji in seinen Gebäuden, Alterthümern und Kunstwerken*. Leipzig.

Parker Pearson, M. & C. Richards 1994. *Architecture and order: approaches to social space*. London; New York.

Patroni, G. 1941. *Architettura preistorica generale ed italica: architettura etrusca*. Rome.

Pesando, F. 1997. *"Domus"-Edilizia privata e società pompeiana fra III e II secolo a.C.* Rome.

Pesando, F. & M.P. Guidobaldi 2006. *Pompei, Oplontis, Ercolano, Stabiae*. Rome.

Peterse, K. 1984. Der oskische Fuß in pompejanischen Atrien, in: *Babesch 59*, 9-30.

Peterse, K. 1985. Notes on the design of the house of Pansa (VI,6,1) in Pompeii, in: *Mededelingen Rome 46*, 35-55.

Peterse, K. 1991. Bauentwurf und Mass-systeme, in: Strocka, M.V. 1991. Casa del Labirinto (VI 11, 8-10), *Häuser in Pompeji 4*, 71-85. München.

Peterse, K. 1993. *Bouwkundige studies van huizen in Pompeii: muurwerk, maatvoering en ontwerp*. Nijmegen.

Peterse, K. 1997. Vitruvius en Pompeii, in: Rolf, R. (ed), *Vitruviuscongres (Heerlen 13-15 oktober; Maastricht 25 oktober 1995)*, 39-41. Heerlen.

Peterse, K. 1999. *Steinfachwerk in Pompeji : Bautechnik und Architektur*. Amsterdam

Peterse, K. & J. de Waele 2005. The standardized design of the Casa degli Scienziati (VI 14, 43) in Pompeii, in: Mols S. & E. Moormann (eds.). *Omni Pede Stare: saggi architettonici e circumvesuviani in memoriam Jos de Waele*, 197-219. Naples.

Peterse, K. 2007. Select residences in Regions V and IX: early anonymous domestic architecture, in: Dobbins, J.J. & P.W. Foss (eds.). *The world of Pompeii*, 373-388. London; New York.

Pirson, F. 1997. Rented accommodation at Pompeii: the evidence of the Insula Arriana Polliana VI 6, in: Laurence, R. & A. Wallace-Hadrill (eds.), *Domestic space in the Roman world: Pompeii and beyond*, 165-182. Portsmouth.

Pirson, F. 1999. *Mietwohnungen in Pompeji und Herkulaneum: Untersuchungen zur Architektur, zum Wohnen und zur Sozial- und Wirtschaftsgeschichte der Vesuvstädte*. Munich.

Pompei. Pitture e Mosaici, Vol. III. 1991. Rome.

Potter, T.W. 1987. *Roman Italy*. London.

Preisshofen, F. 1983. Zur Theoriebildung, in: *Bauplanung und Bautheorie der Antike* (Diskussionen zur Archäologischen Bauforschung 4), 26-33.

Presuhn, E. 1882. *Pompeji: die neuesten Ausgrabungen van 1874 bis 1881*. Leipzig.

Rakob, F. & W.D. Heilmeyer 1973. *Der Rundtempel am Tiber in Rom*. Mainz.

Rakob, F. 1974. Das Quellenheiligtum in Zagouan und die römische Wasserleitung nach Karthago, *Römische Mitteilungen 81*, 76-77.

Rapoport, A. 1969. *House form and culture*. Englewood Cliffs, N.J.

Renfrew, C. 1984. *Approaches to social archaeology*. Edinburgh.

Rich, J. & A. Wallace-Hadrill (eds.) 1991. *City and country in the ancient world*. London.

Richardson jr., L. 1988. *Pompeii: an Architectural History*. Baltimore; London.

Robinson, D.M. et al. 1929. *Excavations at Olynthus*. Baltimore.

Robinson, D.J. 1997. The social texture of Pompeii, in: Bon, S.E. & R. Jones (eds.) *Sequence and space in Pompeii*, 135-144. Exeter.

Ross Holloway, R. 1994. *The archaeology of early Rome and Latium*. London; New York.

Saliou, C. 1994. *Les lois des bâtiments. Voisinage et habitat urbain dans l'empire romain recherches sur les rapports entre le droit et la construction privée du siècle d'auguste au siècle justinien*. Beyrouth.

Saliou, C. 1999. Les trottoirs de Pompéi : une première approche, in : *BABesch 74*, 161-218.

Salmon, E.T. 1995. *Il Sannio e i Sanniti*. Turin.

Samson, R. (ed.) 1990. *The social archaeology of houses*. Edinburgh.

Schipper, F.C. 1992. Notes on the use of the architectural orders in several atrium houses in Pompeii, in: *BABesch 67*, 127-149.

Scholfield, P.H. 1958. *The theory of proportion in architecture*. Cambridge.

Schoonhoven 1999. Residences for the rich? Some observations on the alleged residential and elitist character of Regio VI at Pompeii, in: *BABesch 74*, 219-146.

Schoonhoven, A.V. 2006a. *Metrology and Meaning in Pompeii: the urban arrangement of Regio VI*. Rome.

Schoonhoven, A. 2006b. Defining Space: the plot division of Insula VI 1 of Pompeii, in: *Oebalus: studi sulla Campania nell'Antichità 1*, 113-143.

Schrijvers, P.H. 1989. Vitruve et la vie intellectuelle de son temps, in : Geertman, H. & J.J. de Jong (eds.) *Munus non ingratum*. Proceedings of the International Symposium on Vitruvius' *De architectura* and the Hellenistic and Republican architecture, Leiden 20-23 January 1987, 13-21. Leiden.

Sgobbo, I. 1938. Un complesso di edifici sannitici e i quartieri di Pompei, in: *MemNap 6*, 10-11.

Slofstra, J. 1995. The villa in the Roman west: space, decoration and ideology, in: Metzler, J., M. Millet, N. Roymans & J. Slofstra (eds.), *Integration in the early Roman west: the role of culture and ideology*, 77-90. Luxemburg.

Spinazzola, V. 1963. *Pompei alla luce degli scavi nuovi di Via dell'Abbondanza*. Rome.

Spriggs, M. (ed.) 1977. *Archaeology and anthropology* (BAR suppl. Series 19). Oxford.

Staub Gierow, M. 1994. *Casa del Granduca (VII, 4, 56) und Casa dei Capitelli Figurati (VII, 4, 57)* (Häuser in Pompeji). Munich.

Strocka, M.V. 1991. *Casa del Labirinto (VI 11, 8-10)* (Häuser in Pompeji). Munich.

Tamm, B. 1973. Some notes on Roman houses, in: *Opuscula Romana 9*, 53-60.

Thébert, Y. 1987. Private life and domestic architecture in Roman Africa, in: Veyne, P. (ed.). *A history of private life I. From Pagan Rome to Byzantium*, 313-410 Cambridge.

Tybout, R.A. 2007. Rooms with a view: residences built on terraces along the edge of Pompeii (Regions VI, VII and VIII), in: Dobbins, J.J. & P.W. Foss (eds.). *The world of Pompeii*, 407-420. London; New York.

Waele, J.A.K.E. de 1984. Der römische Fuß in Pompeji: der Tempel des Jupiter Capitolinus, in: *BABesch 59*, 1-8.

Waele, J.A.K.E. de, R.E.L.B. de Kind & C.L.J. Peterse 1996. Case di Pompei ed Ercolano: disegno e progettazione, in: *Opuscula Pompeiana 6*, 1-16.

Wallace-Hadrill, A. 1994. *Houses and society in Pompeii and Herculaneum*. Princeton.

Wallace-Hadrill, A. 1995. Public honour and private shame: the urban context of Pompeii, in: Cornell, T.J. & K. Lomas (eds.). *Urban society in Roman Italy*, 39-63. London.

Wallace-Hadrill, A. 1997. Rethinking the Roman atrium house, in: Laurence, R. & A. Wallace-Hadrill (eds.), *Domestic space in the Roman world: Pompeii and beyond*, 219-240. Portsmouth.

Wallace-Hadrill, A. 2007. The development of the Campanian house, in: Dobbins, J.J. & P.W. Foss (eds.). *The world of Pompeii*, 279-291. London; New York.

Whitelaw, T. 1996. Review of houses and society in Pompeii and Herculaneum by A. Wallace-Hadrill, in: *CAJ 6 (2)*, 317-320.

Wilson-Jones, M. 2000. *Principles of Roman architecture*. New Haven.

Wiseman, T.P. 1987. Conspicui postes tectaque digna deo; the public image of aristocratic and imperial houses in the late republic and early empire. In: *L'Urbs, espace urbaine et histoire,* 393-413. Rome.

Yellen, J.E. 1977. *Archaeological approaches to the present : models for reconstructing the past*. New York.

Zanker, P. 1998. *Pompeii: public and private life*. Cambridge.

Zevi, F. 1991. La città sannitica: l'edilizia privata e la Casa del Fauno, in: Zevi, F. (ed.) *Pompei I*. Naples.

Zevi, F. 1996. Pompei dalla città sannitica alla colonia sillana: per un'interpretazione dei dati archeologici, in: *Les élites municipales de l'Italie péninsulaire des Gracques à Néron*, 125-138. Naples; Rome.

ACKNOWLEDGEMENTS

During the years of my PhD research, I was aided and assisted by countless institutions, colleagues and friends, whom I regrettably cannot all name here.

Firstly, I would like to extend my sincere gratitude to the Netherlands Organization for Scientific Research (NWO), who granted me a five year scholarship. I also want to thank the University of Leiden for offering me accommodation during the entire period of my research, creating a pleasant and inspiring work environment amongst many of my esteemed and cherished colleagues.

I am also grateful to the Dutch Institute at Rome, which generously granted me the "Ted Meijer Stipendium" in 2000, and offered me accommodation during many months in the years thereafter. The members of staff there were always extremely helpful, warm and welcoming. In particular, I would like to thank Prof. Herman Geertman, director of the Institute from December 1997- January 2003 and Stephan Mols and Nathalie de Haan, the successive staff archaeologists during my stays. I must also mention Janet Mente, the Institute's librarian, who helped me countless times in finding obscure publications from the past. Also in Rome, I was fortunate to receive the encouragement of Prof. Andrew Wallace-Hadrill, director of the British School at Rome.

The detailed research of the Pompeian houses on site, both during stays with the RUSPA project and during individual trips, was enabled by the *permessi* from the *Soprintendenza Archeologica di Pompei*. Thanks are especially due to Prof. Pier Giovanni Guzzo, Dr. Antonio D'Ambrosio, Dr. Antonio Varone and Dott. Lina Ferrante. I shared many hard working days on the site and at the poolside of the Motel Villa dei Misteri with my RUSPA team members: Prof. Herman Geertman, Hans Knikman, Natasja Rabouw, Catherine Saliou and Astrid Schoonhoven. I was also fortunate enough to meet colleagues from all over the globe, amongst whom Prof. John Dobbins and Prof. Ian Sutherland.

Special thanks are also due to Prof. Gianetta Murru-Corriga, who kindly received me at the Università di Cagliari and paid me a visit in Pompeii. These encounters were especially informative and helpful for me to define an anthropological perspective in my research.

During the years of my studies, I have made some very dear friends. Erick van Driel, my most faithful supporter at the University of Leiden and sharer of my love for all things Italian, created the frontispiece for this book. Astrid Schoonhoven, RUSPA team member and housemate during my years of study in Leiden, and Nathalie Aalbers, my inspiring roommate at the Dutch Institute, kindly agreed to be my "paranimfen".

Lastly, I cannot express enough thanks to my parents for always believing in me and enabling me to pursue my ambitions and follow my dream.

I dedicate this work to my beloved husband and son.

ORDINATIO ET DISPOSITIO

DESIGN AND MEANING IN POMPEIAN PRIVATE ARCHITECTURE

SUMMARY IN DUTCH

Introductie

Het doel van dit onderzoek is tweeledig. In de eerste plaats leiden de resultaten van de metrologische analyses van achttien Pompeiaanse atrium-peristylium huizen tot een beter begrip van de toegepaste ontwerpmethodes in de antieke privéarchitectuur. Daaruit voortvloeiend bieden de gegevens die voortkomen uit de studie naar het ontwerp van deze huizen een kennisbasis die ons informatie verstrekt over het beroep van de antieke architect, de tradities van het ambacht en de toepassing van specifieke wiskundige modellen, maten en proporties in de ontwerppraktijk. In de tweede plaats bieden de metrologische analyses ons een unieke blik in de sociale betekenis en geschiedenis van de atrium-peristylium huizen, aangezien het ontwerp een aanzienlijke rol speelde in de sociale betekenis en beleving ervan. Verschillende aspecten komen daarbij aan bod, waaronder de keuzes die gemaakt werden door architect en opdrachtgever tijdens het ontwerpproces, de emotionele waarde van het huis binnen een gemeenschap, de toe-eigening van nieuwe architectonische elementen binnen een bestaand model en de invloed van de locatie van een huis binnen de stad.

Dit onderzoek vormt een combinatie van het ontwerptechnische en het sociaalhistorische aspect van de Pompeiaanse elite huizen en past daarmee in een breder wetenschappelijk kader dat de huidige relevante vraagstukken en benaderingswijzen in dit onderzoeksveld verenigt.

Hoofdstuk I: Onderzoeksgeschiedenis en –methodes

Het maken van een betrouwbare reconstructie van het ontwerp van een antiek gebouw vereist herkenning van de oorspronkelijke structuur binnen het bouwwerk. In het geval van de Pompeiaanse atrium-peristylium huizen in dit onderzoek is er altijd sprake van een lange bewoningsgeschiedenis van waarschijnlijk minstens twee eeuwen. Vanzelfsprekend hebben er gedurende de opeenvolgende bewoningsfasen veranderingen plaatsgevonden in de structuur van het oorspronkelijke huis, in de vorm van verbouwingen, toevoegingen of afbraak. Teneinde de verschillende bouwfases binnen de bebouwde structuur van Pompei te herkennen wordt reeds vanaf de tweede helft van de negentiende eeuw een schematische indeling van constructieperiodes gehanteerd. Deze indeling is gebaseerd op de toekenning van het gebruik van specifieke bouwmaterialen en –technieken aan historische periodes in de geschiedenis van de stad. Voor de privéarchitectuur is men er lange tijd vanuit gegaan dat de vroegste huizen werden gebouwd met het gebruik van grote kalksteenblokken (*opus quadratum* en *opus africanum*), een techniek de gedateerd werd tussen het derde kwart van de vijfde eeuw en het eind van de derde eeuw v.Chr. Daaropvolgend werden nog vier bouwperiodes

herkend, waarin de techniek zich ontwikkelde naar het gebruik van kleinere brokken steen die met mortel bijeen werden gehouden (*opus incertum*) en verdere verfijningen van deze techniek (*opus (quasi)reticulatum*). Het gebruik van baksteen (*opus latericium*) dateert men na Sulla en kwam vooral in gebruik in de keizertijd.

Recentelijk is er, naar aanleiding van een serie stratigrafische onderzoeken in atriumhuizen op verschillende locaties in de stad, veel kritiek ontstaan op deze traditionele en rigide chronotypologie. In tegenstelling tot de oorspronkelijk datering van de 'kalksteenhuizen' van Pompei in de vijfde en vierde eeuw v.Chr., wijzen de huidige onderzoeksresultaten aan dat deze huizen niet voor 200 v.Chr. gedateerd kunnen worden.

Ondanks het feit dat nu duidelijk is aangetoond dat het dateren van bouwfases aan de hand van de toegepaste bouwmaterialen en –technieken problematisch is, is het wel degelijk mogelijk om, door een gedetailleerde analyse van de muurwerkstructuren binnen één bouwwerk, tot een betrouwbare reconstructie van de relatieve bouwgeschiedenis te komen, en daarmee tot herkenning van de oorspronkelijke afmetingen en vorm.

Hierop volgend kunnen de maten van de verschillende ruimtes van de oorspronkelijke bouwstructuur, nadat zij zijn omgerekend naar de relevante antieke standaardmaat (de Oskische voet), gebruikt worden voor het uitvoeren van de metrologische analyse. Uit het geheel van de maten wordt gezocht naar het onderliggende systeem dat deze maten op een heldere en eenvoudige manier met elkaar verbindt in één samenhangend ontwerpschema.

Het metrologisch onderzoek naar atriumhuizen in Pompei werd door twee personen in het bijzonder reeds eerder gedaan, Kees Peterse en Herman Geertman. De verschillende benaderingswijzen en interpretaties van deze onderzoekers worden geanalyseerd en vergeleken. Zij vormen de theoretische basis van de onderzoeksmethode die in deze studie verder is uitgewerkt.

Hoofdstuk II: Vitruvius' De architectura

De belangrijkste antieke bron op het gebied van de Romeinse architectuur bestaat uit de tien boeken van Vitruvius' *De architectura*. Deze bron biedt ons een unieke blik op de verschillende aspecten die een rol speelden in het antieke ontwerpproces. Tevens informeert Vitruvius ons over de theoretische en praktische kanten van het vak van de antieke architect, zijn scholing, de ambachtelijke tradities, en de eisen en verwachtingen van de samenleving waaraan zijn ontwerp moest voldoen. Boek VI is geheel geweid aan de privéarchitectuur en besteedt in het bijzonder aandacht aan het atriumhuis.

Op het gebruik van *De architectura* als bron bij de bestudering van de Pompeiaanse atriumhuizen is nogal wat kritiek geweest, aangezien Vitruvius' voorschriften in het verleden letterlijk werden overgenomen en gebruikt om de huizen te beschrijven en de functies van ruimtes te verklaren. Dit leidde tot het ontstaan van een 'typisch' Romeins atriumhuis in de vroege vakliteratuur, waarbij de ideale lay-out exact voldeed aan de interpretatie van het door Vitruvius geschetste beeld. Ook het grote tijdsverschil tussen de bouwperiode van de Pompeiaanse atriumhuizen (tweede eeuw v.Chr.) en de periode waarin Vitruvius zijn

overzichtswerk schreef (eind eerste eeuw v.Chr.) is aanleiding tot kritiek op het gebruik van deze bron.

Tegen deze bezwaren zijn echter een aantal argumenten in te brengen die duidelijk maken dat een verstandig gebruik van deze bron niet alleen wenselijk maar zelfs noodzakelijk is. Enerzijds kan men Vitruvius' werk niet interpreteren als slechts een beperkte beschrijving van de status quo in het vak van de architect binnen een beperkt tijdsbestek. In tegendeel, *De architectura* is representatief voor een langdurige architectonische traditie, die reeds lang voor Vitruvius' tijd in gang was gezet. Anderzijds is er meer dan voldoende bewijs dat de Pompeiaanse huizen niet slechts een reflectie zijn van een tijdelijke lokale bouwtraditie, maar onderdeel van een wijd verspreide Italische bouwtraditie, zowel in geografische als chronologische zin. Vanuit dit perspectief is het zinvol om *De architectura* te gebruiken als theoretische achtergrond en als architectuurhistorisch kader voor de analyse van de Pompeiaanse atrium-peristylium huizen.

Hoofdstuk III: Antieke wiskunde

Bij het maken van een reconstructie van het antieke ontwerpproces worden we geconfronteerd met de tradities en de praktijk van het vak van de antieke architect. Hierbij komen verschillende vragen aan bod, zoals: welke ontwerpmethodes waren onderdeel van het algemene kennisgoed van architecten in een bepaalde periode? Binnen welke wiskundige traditie was een architect werkzaam? En ook, wat was de algemene ontwerppraktijk van zijn tijd en van zijn voorgangers?

Om tot een begrip te komen van de wiskundige principes die werden toegepast door de Pompeiaanse architecten, en in de Romeinse architectuur in het algemeen, moeten we teruggaan naar de zesde en vijfde eeuw v.Chr., de tijd van Pythagoras en zijn volgelingen. Dit was een historische periode waarin de antieke Grieken niet alleen de wiskunde ontwikkelden zoals wij die vandaag nog steeds gebruiken, maar ook een tijdperk van bredere en invloedrijke veranderingen in de manier van intellectueel denken. Eén van de belangrijkste ontwikkelingen daarin was de opkomst van het abstract denken en gerelateerd daaraan, de ontdekking van het *irrationele* in de wiskunde. Dit begrip werd gepresenteerd als de incommensurabiliteit van de zijde en de diagonaal van een vierkant, hetgeen betekent dat als de zijde van het vierkant wordt uitgedrukt in een rationeel getal, dit onmogelijk is voor de diagonaal, aangezien de twee zich verhouden als $1 : \sqrt{2}$. Om dit probleem op te lossen werden series van getallenparen ontwikkeld om deze verhouding te benaderen. Deze series zijn in de Pythagoreïsche en latere antieke wiskunde bekend als aritmetische approximaties van geometrische proporties.

Met een gedegen kennis van de wiskundige traditie waarin een architect werkzaam was en van de wiskundige principes en middelen die veelvuldig gebruikt werden, zijn we in staat om een algemeen kader te creëren dat een theoretische achtergrond biedt voor de metrologische analyse van antieke bouwwerken.

Hoofdstuk IV: het atriumhuis in historisch perspectief

Het Pompeiaanse atriumhuis was het resultaat van een lange historische ontwikkeling van een typisch Italische huisvorm. Ondanks het vele bewijsmateriaal van dit huistype, dat zowel chronologisch als geografisch wijd verspreid voorkomt op het Italische schiereiland, blijft de kwestie van de ontwikkeling van dit type nog altijd gedeeltelijk onduidelijk.

Studies in het verleden waren vooral gericht op de herkenning van één bepaald huistype, dat gedefinieerd was met behulp van de voorschriften van Vitruvius. Het atriumhuis werd daarmee in de literatuur gekarakteriseerd als het 'ideale Romeinse huis'. Deze theoretische ideale vorm werd vervolgens gebruikt als uitgangspunt voor de creatie van een evolutionaire ontwikkeling van dit type, waarvan het compluvium-impluvium arrangement als het belangrijkste kenmerk werd beschouwd. In deze benadering werd zelden of geen rekening gehouden met de mogelijkheid dat de vroege 'atriumhuizen' in feite huizen met een open binnenhof konden zijn, aangezien Vitruvius daar in zijn voorschriften van de verschillende dakconstructies van het atriumhuis niet over rept. Als gevolg werden voorbeelden van hofhuizen die niet precies voldeden aan het geïdealiseerde typehuis door hun opgravers buiten de categorie van de atriumhuizen geplaatst. Of, als de spaarzame archeologische bewijzen niet voldeden, schroomden de onderzoekers ook niet om ze aan te vullen met materiaal uit andere bronnen – textueel of archeologisch- om een 'passend' totaalbeeld te creëren.

Meer recent onderzoek, en met name dat van Andrew Wallace-Hadrill (1997), laat echter duidelijk zien dat er wel degelijk een relatie bestaat tussen de open hofhuizen en de Pompeiaanse atriumhuizen. De belangrijkste bindende factor tussen deze huizen is niet de dakconstructie boven het centrale hof, maar de dispositie van de verschillende ruimtes rondom dat hof. Wanneer de hofhuizen op deze manier benaderd worden, zijn er niet alleen aanwijzingen voor verwantschap tussen een groot aantal Italische huizen, maar kunnen zelfs vergelijkingen worden gemaakt met huizen uit de Griekse wereld, zoals Olynthus.

Deze benadering maakt duidelijk dat het Pompeiaanse atriumhuis niet meer gezien kan worden als het typische Romeinse huis – en daarmee kenmerkend voor alles wat met die cultuur samenhangt – maar meer als een variant in een grote familie van hofhuizen, uiteenlopend van zeer eenvoudige structuren rond een open hof tot de paleisachtige atrium-peristylium complexen van de Pompeiaanse elite.

Hoofdstuk V: de sociaalhistorische context van het atrium-peristylium huis

Het laatste hoofdstuk vormt een synthese van de kennis die we reeds bezitten over de Pompeiaanse atrium-peristylium huizen in de sociaalhistorische context, en de nieuwe informatie die daaraan wordt toegevoegd vanuit het oogpunt van de metrologische analyse van hun ontwerp. Thema's die daarbij aan bod komen zijn: de functies van de verschillende ruimtes in een huis en de hiërarchie die daartussen bestond; de scheiding tussen 'publieke' en 'privé'-ruimte in een huis; en ook de relatie van het huis met de buitenwereld en de betekenis van de positie van een huis in het stratennetwerk van de stad. Deze en andere relevante

thema's worden belicht vanuit verschillende onderzoeksoptieken, die hun oorsprong hebben in de archeologie, kunstgeschiedenis en sociale geschiedenis.

Vernieuwend en verhelderend is de belichting van een aantal van deze thema's vanuit een antropologisch perspectief, aan de hand van een relevante studie van de traditionele huizenbouw op het eiland Sardinië.

Ook de resultaten van de metrologische analyses worden hier gerelateerd aan dezelfde thema's. Deze invalshoek leidt niet alleen tot nieuwe inzichten op een ontwerptechnisch niveau – zowel in wiskundig-theoretisch opzicht als ambachtelijk-praktisch opzicht – maar biedt ook nieuwe informatie op een sociaalhistorisch niveau.

Conclusies

In dit onderzoek is de benaderingswijze van de metrologische analyse gebruikt om twee verschillende aspecten van de Pompeiaanse privéarchitectuur te bestuderen: ontwerp en betekenis, oftewel de ontwerpmethodes die werden toegepast door de Pompeiaanse architecten en de sociale betekenis die onderdeel uitmaakte van dat ontwerp. Hiermee past dit onderzoek in de actuele contextuele benaderingswijze van het breder wetenschappelijke onderzoekskader van de Pompeiaanse privéarchitectuur. In tegenstelling tot vroegere studies op dit gebied, die vooral gericht waren op deelaspecten van de architectuur en het creëren van typologieën van die aspecten, is de aandacht nu sterk verschoven naar vragen aangaande het sociale gedrag van de antieke mens en het functioneren van de antieke samenleving.

De uitkomsten van de afzonderlijke metrologische analyses hebben een duidelijk beeld geschetst van de architectuurtraditie waarin de huizen zijn ontworpen en gebouwd. Zij zijn het resultaat van een geometrische ontwerpmethode, uitgedrukt in aritmetische approximaties. Deze methode werd breed toegepast in de antieke bouwkunde en had als kracht dat zij zowel de architect verschafte met goed bruikbare proporties en modellen op theoretisch niveau, maar ook makkelijk toepasbare afmetingen voor op de bouwplaats. De vergelijking van de achttien huizen binnen de hier bestudeerde groep laat duidelijk zien dat zij gebaseerd waren op bestaande schema's van maten en proporties, die regelmatig werden toegepast in huizen van vergelijkbare afmetingen en vorm. In die zin vormen de huizen een vrij homogene, uniforme groep, die duidelijke kenmerken vertoont van één ontwerptraditie. Zij hebben echter elk een uniek karakter, hetgeen een uiting is van de kunde en kennis van de architect en van de persoonlijke wensen van de opdrachtgever, die tezamen van een huis een uniek project maakten.

In tegenstelling tot de duidelijke inheemse ontwerptraditie die zich laat aflezen in de atriumhuizen, is het peristylium een latere toevoeging van buitenaf. Dit fenomeen wordt benadrukt in de metrologische analyses, die niets laten zien van de schema's van maten en proporties van de atriumhuizen. De afmetingen en positionering van het peristylium en de omliggende ruimtes lijken eerder het resultaat van een combinatie van praktische en esthetische overwegingen. Dit wil echter niet zeggen dat er een totaal gebrek was aan ruimtelijke integratie en samenhang tussen atrium en peristylium. In een groot aantal gevallen

creëerde de architect een gevoel van eenheid door de proportionele verdeling van ruimtes in het atriumhuis te herhalen in het peristylium. Vooral de opeenvolging van ruimtes langs de centrale zichtas van het gehele wooncomplex werd zorgvuldig op elkaar afgestemd, teneinde een gevoel te schetsen van samenhang en symmetrie.

Het feit dat deze kenmerkende eigenschap van het atriumhuis, de zichtas, waar ook in andere studies veel aandacht aan is besteed, onderdeel uitmaakt van het totale ontwerp van het huis, en door de architect werd gebruikt en gemanipuleerd bij de integratie van het peristylium, doet vermoeden dat het meer was dan slechts een manier om de aandacht van voorbijgangers of bezoekers te trekken. De zichtas vormde een sterke bindende factor in de ruimtelijke indeling van het huis en werd ook als zodanig herkend en gebruikt door de architect.

Deze manier van ruimtelijke manipulatie om een gewenst beeld te creëren is één van de eigenschappen van het ontwerp dat een duidelijke sociale boodschap uitdraagt. Hoezeer de keuzes die gemaakt werden tijdens het ontwerpproces niet alleen van professionele of praktische aard waren, maar ook voort konden komen uit persoonlijke overwegingen van de opdrachtgever, kan goed worden geïllustreerd met een geval van twee huizen die als één bouwproject gerealiseerd werden, de Casa di Philippus (VI 13, 2) en de Casa di M. Terentius Eudoxus (VI 13, 6). Bij het ontwerpproces van deze huizen speelden twee factoren een cruciale rol: competitiedrang en gebrek aan monetaire fondsen. Om de schijn van een groots bouwwerk op te houden in een buurt waar een hoge concentratie van elite woningen werd gebouwd, besloten twee individuen de handen ineen te slaan. Ze lieten hun huizen bouwen naar één ontwerp, verscholen achter een façade die het beeld gaf van een achterliggend bezit dat kon wedijveren met het grootste privébezit in de stad, hun buurman, de Casa del Fauno.

In de huidige studie is gebleken dat de metrologische analyse een waardevolle benaderingswijze is en een toevoeging aan de bestaande onderzoeksmethodes die gericht zijn op antieke architectuur. De metrologische analyse als onderzoeksmethode is wellicht het meest waardevol door het non-destructieve karakter. Tevens biedt het ons informatie van grote historische diepte, in de herkenning van de oorspronkelijke bezitsgrenzen en indeling van bouwwerken, hetgeen anders alleen door opgraving bereikt kan worden.

CURRICULUM VITAE

Leonore Maria van Krimpen-Winckel werd geboren op 29 april 1975 in Berkel en Rodenrijs. Zij volgde het voortgezet onderwijs aan het Erasmiaans Gymnasium te Rotterdam, waar zij in 1993 eindexamen deed in de volgende vakken: Nederlands, Engels, Frans, Latijn, Natuurkunde, Scheikunde, Wiskunde B en Biologie.

Van 1993-1994 verbleef zij een jaar in Chambéry en Parijs om zich toe te leggen op de Franse taal.

Van 1994 tot 2000 studeerde zij archeologie aan de Universiteit Leiden met als specialisatie Klassieke Archeologie. In 1995-1996 studeerde zij Archaeology and Ancient History aan de University of Leicester. In 2000 studeerde zij af met de scriptie getiteld "*A contribution to the study of private architecture in Pompeii*" (*judicium cum laude*).

Na beëindiging van haar studie was zij werkzaam bij de archeologische onderzoeksschool ARCHON en kreeg zij het Ted Meijer Stipendium toegekend voor een studieverblijf van drie maanden aan het Nederlands Instituut te Rome. Aansluitend begon zij in december 2001 met haar promotieonderzoek, gefinancierd door NWO en uitgevoerd aan de Universiteit Leiden.

Vanaf 2000 is Noor staflid van het RUSPA (*Ricerche Urbanistiche Su Pompei Antica*) project onder leiding van Prof. Herman Geertman.

Eerder publiceerde zij "Building history and methods of design of atrium houses in the social context of Pompeii", in: *AIACNews 36: incontri dell'A.I.A.C. 14 aprile 2003, Roma* (2003, online publication). En "Pompeian twins: design and building of the Casa di Philippus (VI 13, 2) and the Casa di M. Terentius Eudoxus (VI 13, 6)", in: *BABesch 81*, 135-168 (2006).